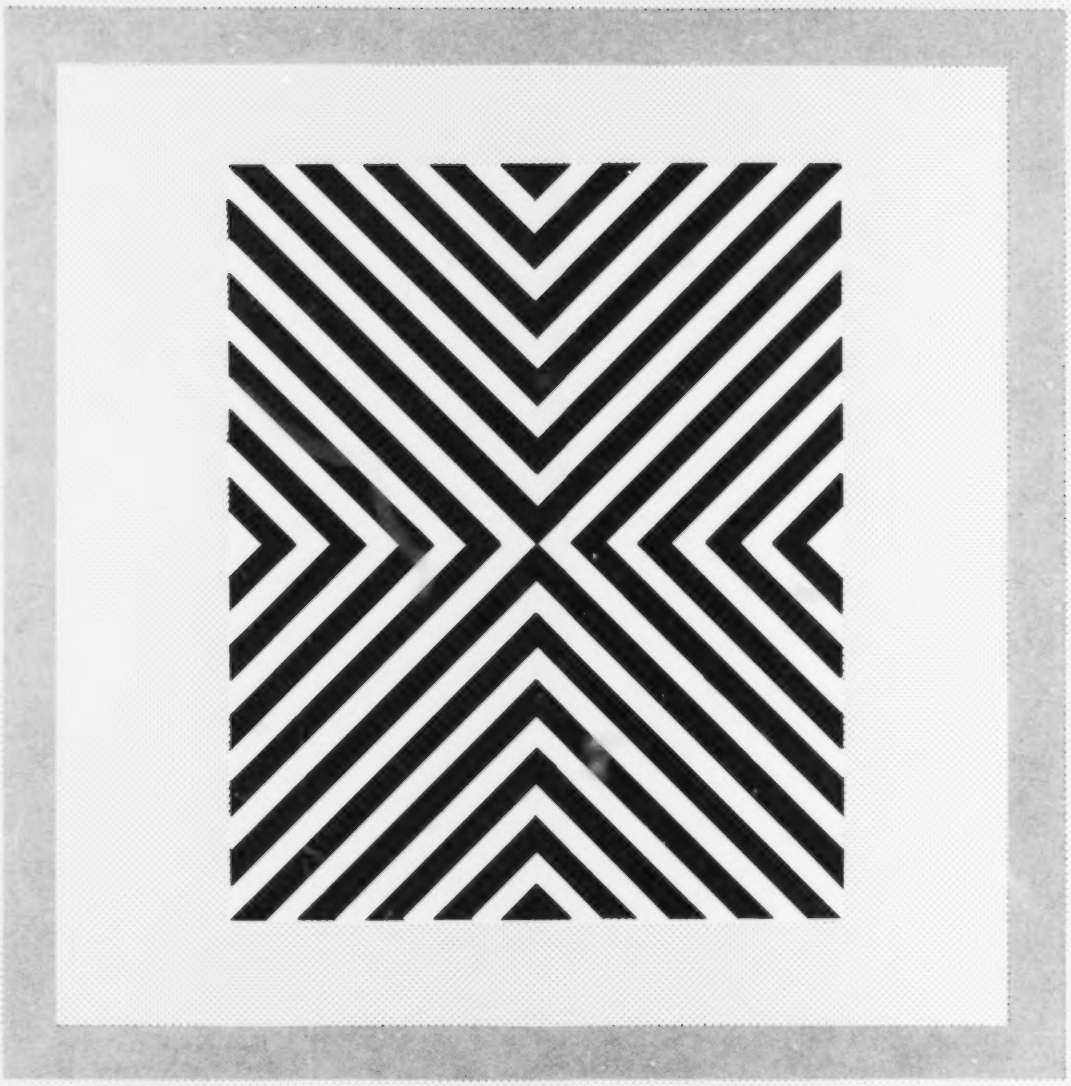
UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

REPORT ON THE AGRO-INDUSTRIAL SECTOR AND THE FRAMEWORK OF TECHNOLOGY TRANSFER IN BURUNDI



UNITED NATIONS

Distr. GENERAL

UNCTAD/ITP/TEC/25
8 April 1992

ENGLISH
ENGLISH AND FRENCH ONLY

UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT
Geneva

Report on the agro-industrial sector and the framework of technology transfer in Burundi

Report prepared by the UNCTAD secretariat
in collaboration with Dr. Cheikh Ndiaye

Project BDI/85/T01 - Transfer and development of technology, financed by the United Nations Fund for Science and Technology for Development (UNFSTD) and carried out by the United Nations Conference on Trade and Development (UNCTAD), Advisory Service on Technology Transfer, Technology Programme

UNITED NATIONS
New York, 1992

NOTE

Symbols of United Nations documents are composed of capital letters combined with figures. Mention of such a symbol indicates a reference to a United Nations document.

* * *

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

* * *

The views expressed in this paper are those of the author and do not necessarily reflect the views of the UNCTAD secretariat. The terminology is that of the author.

UNCTAD/ITP/TEC/25

CONTENTS

Main abbreviations used vi

Introduction x
Chapter I: Legal and institutional framework of technology transfer in the context of the current economic situation in Burundi 1

A. Legal framework of technology transfer 1
B. Institutional framework and supporting machinery 3
1. National Investment Commission 4
2. Contract Allocations Board 4
3. Industrial Promotion Centre (CPI) 5
4. Chamber of Commerce, Industry, Agriculture & Crafts (CCI) . 5
C. The current economic situation and its effects on technology transfer in Burundi 5

Chapter II: Main characteristics of food production 7

A. Agricultural situation 7
1. Food production 7
2. The part played by coffee, tea, cotton and sugar 10
3. Stock farming and fishing 14
4. Some recommendations on fishing and fish products 15
B. Role and contribution of food production 17
C. Availability 19

Chapter III: Trade in, storage and preservation of foodstuffs 21

A. Aspects of the food trade 21
1. Food crops 21
2. Export crops 25
3. Products of animal origin 26
B. Storage and preservation 27
C. Some recommendations 27

Chapter IV: Technology and the food industry in Burundi 30

A. General survey of the food industry 30
1. Main categories of food industry 30
2. The role of foodstuff imports and exports 33
B. Processing and preservation of the main foodstuffs 34
1. Cereals 35
2. The brewing and soft drinks industry 40
The Brarudi brewery 41
3. The sugar and confectionery industry 41
4. The fruit and vegetable industry 44
5. The vegetable oil industry 47
6. The meat and meat products industry 49

7. The milk and dairy products industry 51
Recommendations on the dairying sector 55
8. The coffee industry 55
9. The tea industry 56
(i) The importance of leaf quality 56
(ii) The manufacturing process 57
C. Types of support for food processing 59
1. Situation and prospects of the packaging industry 60
Locally produced packaging 60
Packaging for agricultural and fishery products 61
Import packaging 62
Packaging problems 62
2. Laws and regulations 63
3. Information systems 64
4. Financial questions 65
(i) Financial support - incentives 65
(ii) Taxation policy 66
(iii)Other incentives 66
5. Electricity and water supply 67
(i) Electricity and fuel supply 67
(ii) Water supply 68
D. Training, research and development in the agro-industrial sector 69
1. Instruction 69
2. Research 70
E. Policies and programmes with a bearing on the technological development of the food industry 71
1. Policies 71
2. Programmes 72
3. Ways of identifying and promoting projects to do with the processing of agricultural products 72
(i) Studies of product use and agro-industrial potential . 73
(ii) Industries for which provision is made in the Fifth Five-Year Plan 73

Chapter V: Summary of conclusions and recommendations 74

A. General observations and recommendations 74
B. Observations and recommendations by branches of industry 75
1. Recommendations for improvements in the trade in inputs and crops 78
2. Recommendations for the bakery industry 79
3. Recommendations for the dairy industry 79
4. Recommendations to exporters 80
5. Recommendations on packaging to manufacturers and the Government 80
6. Standardization and quality control 81
7. Information system 82
8. Recommendations on financing 82
9. Water and electricity supply 82
10. Training, research and development in the agro-industrial sector 83
11. Technological development policy and programmes for the food industry 83

12. Plan for manpower training and technological strengthening of the agro-industrial sector 83
13. Recommendations to donor countries and international organizations 84

Annex 1 List of institutions and undertakings visited and persons seen .. 85

Annex 2 Project identification and listing 88

Annex 3 List of documents consulted 90

Main abbreviations used

ADB	African Development Bank
ANVAR	National Association for the Development of Research [Agence nationale de valorisation de la recherche]
BA	Bujumbura abattoir
BANCOBU	Commercial Bank of Burundi [Banque Commerciale du Burundi]
BNDE	National Economic Development Bank [Banque Nationale pour le Développement Economique]
BRARUDI	Burundi Brewery [Brasserie du Burundi]
BRB	Bank of the Republic of Burundi [Banque de la République du Burundi]
CAMFI	Office of Mobilisation and Finance [Caisse de Mobilisation et de Financement]
CCCE	Central Office for Economic Cooperation [Caisse Centrale de Coopération Economique]
CCI	Chamber of Commerce, Industry, Agriculture and Crafts [Chambre de Commerce, de l'Industrie, d'Agriculture et d'Artisanat]
CECI	Canadian Centre for Research and International Cooperation
CFDT	French Textiles Development Company [Compagnie Française de Développement des Textiles]
CFP	Vocational Training Centre [Centre de Formation Professionelle]
CICM	International Centre of Crédit Mutuel (France) [Centre International de Crédit Mutuel (France)]
CNI	National Data-Processing Centre [Centre National d'Informatique]
COGERCO	Cotton Management Company [Compagnie de Gérance Cotonnière]
COLEACP	Europe-Africa-Caribbean-Pacific Liaison Committee [Comité de Liaison Europe-Afrique-Caraïbes-Pacifique]
COPEC	Savings and Credit Cooperative [Coopérative d'Epargne et de Credit]
COTEBU	Bujumbura Textile Complex [Complexe Textile de Bujumbura]

CPI	Industrial Promotion Centre [Centre de Promotion Industrielle]
CRDI	Research Centre for International Development [Centre de Recherche pour le Développement International]
CURDES	University Research Centre for Economic and Social Development [Centre Universitaire de Recherche pour le Développement Economique et Social]
EDF	European Development Fund
EEC	European Economic Community
EPB	Bujumbura Port Undertaking [Exploitation du Port de Bujumbura]
EPIMABU	Government-owned Office Equipment Importing Corporation
FAC	Fonds d'Aide et de Coopération (France) [Aid and Cooperation Fund]
FAO	United Nations Food and Agricultural Organization
FADI	Insecticide Plant [Fabrique d'insecticides]
FHR	Rural Settlement Fund [Fonds de l'Habitat Rural]
FPE	Economic Promotion Fund [Fonds de Promotion Economique]
HAFC	High Altitude Food Crops
IBF	Belgian Institute for Training and Technology Transfer [Institut Belge de Formation et de Transfert de Technologie]
IDA	International Development Agency
IFAD	International Fund for Agricultural Development
INABU	Burundi Government Printing Office [Imprimerie Nationale de Burundi]
INADES	National Institute of Economic and Social Development [Institut National de Développement Economique et Social]
INEAR	National Institute for Agronomic Studies of the Congo and Rwanda Urundi [Institut National pour les Etudes Agronomiques du Congo et du Rwanda Urundi]
ISABU	Burundi Institute of Agronomic Sciences [Institut des Sciences Agronomiques du Burundi]
LAPHAVET	Pharmaceutical and Veterinary Laboratory [Laboratoire Pharmaceutique et Vétérinaire]

LCB	Bujumbura Central Dairy [Laiterie Centrale de Bujumbura]
MDR	Ministry of Rural Development [Ministère de Développement Rural]
MINAGRI	Ministry of Agriculture [Ministère de l'Agriculture]
MINOTEBU	Burundi Flour Mills [Minoterie du Burundi/Ministère de Muramvya]
MFP	Public Finance Company [Mutuelle Finance Publique]
MUSALAC	Musaga Health Centre
NPK	Nitrogen, Phosphorus, Potassium
OCIBU	Burundi Office of Industrial Crops [Office des Cultures Industrielles de Burundi]
ONAMA	National Office of Agricultural Mechanization [Office National de la Mécanisation Agricole]
ONAPHA	National Pharmaceutical Office [Office National Pharmaceutique]
ONATEL	National Telecommunications Office [Office National des Télécommunications]
ONATOUR	National Peat Office [Office National de la Tourbe]
ONC	National Trade Office [Office National du Commerce]
ONIMAC	National Office for the Importation of Building Materials [Office National d'Importation du Matériel de Construction]
ONT	National Tourist Office [Office National du Tourisme]
OTB	Burundi Tea Office [Office du Thé du Burundi]
OTRABU	Burundi Transport Office [Office du Transport du Burundi]
PTA	Principal Technical Adviser [Conseiller Technique Principal]
REGIDESO	Water and Electricity Distribution Corporation [Régie de Distribution d'Eau et d'Electricité]
SAB	Agricultural Company of the Burundi Breweries [Société Agricole des Brasseries du Burundi]
SBF	Burundi Finance Company [Société Burundaise de Financement]
SHER	Water Engineering and Rural Equipment Company [Société Hydraulique et de l'Equipement Rural]

SHNB	Burundi New Hotel Company [Société Hôtelière Nouvelle du Burundi]
SHTB	Burundi Hotel and Tourism Company (Source of the Nile) [Société Hôtelière et Touristique du Burundi]
SME	Small and Medium-sized Enterprises
SNES	National Research and Statistics Department [Service National des Etudes et Statistiques]
SOBECOV	Burundi Foodstuff Warehousing and Trading Company [Société Burundaise d'Entreposage et de Commerce des Produits Vivriers]
SOBUGEA	Burundi Airport Management Company [Société Burundaise de Gestion Aéroportuaire]
SOCEGI	Gifurive Animal Husbandry Company (an Agribal subsidiary) [Société d'Elevage de Gifurive]
SOKINABU	Burundi Quinine Company [Société de Quinquina du Burundi]
SOSUMO	Moso Sugar Company [Société Sucrière du Moso]
SOPOBU	Burundi Fish Processing Company [Société des Usines de Poissons du Burundi
SRD/B/G/I/R	Regional Development Company [Société Régionale de Développement] (Buyenzi/Gitega/ Imbo Region/Rumonge)
UNCDF	United Nations Capital Development Fund
UNICEF	United Nations Children's Fund
UNIFEM	United Nations Development Fund for Women
VERRUNDI	Burundi Glassworks [Verrerie du Burundi]

Introduction

This report has been prepared at the request of the Government of Burundi in the context of project BDI/85/T01 Transfer and Development of Technology. A mission consisting of the international consultant, Dr. Cheikh Ndiaye, Mr. Etienne Baradandikanya, national consultant, and Mr. Assad Omer of the Advisory Service on Transfer of Technology, Technology Programme, United Nations Conference on Trade and Development (UNCTAD), went to Burundi from 11 June to 18 July 1989 to examine the part played by technology in the various phases of the agro-industrial system and the framework of technology transfer, and to make recommendations for the strengthening of the agro-industrial sector.

A first draft of the combined mission's report was prepared by Dr. Cheikh Ndiaye, Dakar, Senegal. The Ministry of Trade and Industry had some comments to make on this draft, and they were considered by Dr. Cheikh Ndiaye with a view to their incorporation in the report. The contributions made by all parties economically concerned with the transfer and use of technology who attended the national seminar on the transfer and development of technology (Bujumbura, 18-22 March 1991) served for preparation of the final draft of this report. Project BDI/85/T01, which is being carried out by UNCTAD, is financed by the United Nations Fund for Science and Technology for Development (UNFSTD). The Government of Burundi, and in particular the Ministry of Trade and Industry, which is directly concerned with the project, has given all necessary support in the production of this report, and especially the assistance rendered by Mr. Emmanuel Bazikamwe at the time of the combined mission. The Government has indicated that it is in favour of the publication of the report in the hope that it may be of some interest to other developing countries, especially the least developed, who attach great importance to the role of technology and think that the food-industry sector is fundamental to the satisfaction of the basic needs of their peoples, and in order to sustain their exports, and hence their participation in international trade.

The UNCTAD secretariat and, in particular, the Advisory Service on Transfer of Technology, wishes to express its warm thanks to the many public figures in Burundi and also to the United Nations Development Programme (UNDP) in Bujumbura who helped to make this document possible through the provision of information, through giving their opinions and by providing support of various kinds.

The report has five chapters, the first of which examines the legal and institutional framework of technology transfer in the context of the current economic situation in Burundi. The second chapter assesses the main characteristics of food production. The third chapter deals with trade in foodstuffs, and their storage and preservation. The fourth chapter analyses the technological situation of the food industry in Burundi, while the fifth gives a brief summary of the conclusions and recommendations. Further specific conclusions and recommendations are set out in the body of the report and at the end of each technical chapter.

Chapter I

Legal and institutional framework of technology transfer in the context of the current economic situation in Burundi

There has already been an UNCTAD report dealing with the policy trends, the legislation, the institutional arrangements and the practices concerned in the acquisition and development of technology in Burundi.1/ The aim of this chapter is to examine the salient points of the changes that have taken place in the institutional mechanisms and the evolution of policy trends, legislation and practice regarding the transfer and use of technology during the 1980s, a decade in which there were important changes in the economy of Burundi.

A. Legal framework of technology transfer

The Investment Code promulgated on 14 January 1987, which replaced the Investment Code of 4 April 1979, is proving to be the essential legal instrument for the promotion and stimulation of investment. 2/ The drafting of the Code was undertaken in 1983 with a view to making it more attractive to investors. Thus, it is the aim of the Code to define the guarantees given for investments in Burundi, the associated rights and obligations, and the various regimes under which investments may be made. Four regimes are envisaged to that end: the regimes of the ordinary law, the approved priority activity, the officially agreed enterprise, and the decentralized enterprise.

In accordance with the Code, the investment may be Burundi capital, foreign capital or mixed capital. Resources raised abroad, but belonging to citizens of Burundi are treated as being Burundi capital. The right to transfer Burundi capital and income from capital is guaranteed by the Code, provided that exchange-control provisions are respected. In consequence, no discrimination is established between Burundi capital and foreign capital. The essential aim of the distinction between Burundi capital and foreign capital is to provide foreign capital with a guarantee of repatriation of income on capital invested, in the form of dividends, and of the capital in the case of cessation of activity. The benefits accorded by the Code to the various regimes referred to above relate to exemptions from import duties and charges on materials and equipment, and on raw materials, to tax exemptions and exemptions from other charges, and to guarantees of the availability of foreign currency for imports and for loan repayments.

As regards the transfer of technology through investment, it should be commented that the criteria that distinguish one regime from another include elements relating to technological inputs into the country. To the extent that the Investment Code enables benefits to be conferred in relation to the contribution that the promoters make to national development, due consideration to the factors of technology transfer should be given in

---

1/ Transfer and Development of Technology in Burundi - Report of an UNCTAD Mission (UNCTAD/TT/38), United Nations publication, 1980.

2/ Act No. 1/005 of 14 January 1987 on the Investment Code of Burundi.

the taking of decisions by the bodies responsible for applying the provisions of the Code. It may be noted with satisfaction that the benefits of the various regimes envisaged by the Code are not to be granted solely in relation to the size of the financial input. If the idea is accepted that the successful acquisition of imported technology and the development of the local technological potential are two essentials in the economic development of a country, an Investment Code must include the factors of technology transfer and must give rise, through its application, to measures of encouragement for the acquisition, use and development of technology.

Thus, brief consideration could be given to the conditions that must be satisfied by promoters wishing to avail themselves of the benefits of the regime of approved priority enterprises.

The definition of a priority enterprise is one whose planned investment is of a value that equals or exceeds the level fixed by order of the Ministry of Planning and that satisfies the conditions set out in Article 17 of the Investment Code. There are nine of these conditions, and it is evident from Article 18 of the Code that they may not all be given the same weighting. To be quite precise, the benefits accorded will vary in relation to the importance of each of the following factors:

- adequate technical and financial guarantees;

- recruitment and training of personnel who are Burundi nationals;

- activities to be undertaken in a priority sector;

- the creation of permanent jobs and the production of consumer goods or capital goods;

- import substitution or the expansion of exports;

- dissemination and development of technology;

- achievement of the aims of the Plan of Economic and Social Development;

- the contribution to regionally balanced development;

- respect for the conditions for application of the Code.

In order to enjoy the benefits of the regime of agreed enterprises, investors must satisfy three conditions in addition to those set out above. They are elements that must be present in the investment project submitted for approval, and are concerned with the feasibility study; job creation as stipulated by the Ministry of Planning; and lastly the importance of the investment to the economic and social development of Burundi.

To the extent that these qualifying factors are satisfied, every promoter may therefore enjoy benefits, which may be regarded as very generous. The benefits granted to those enterprises regarded as priority enterprises may consist of measures of exemption or partial exemption from profit tax, property tax and land tax for a period of eight years, from import duty on equipment and raw materials for a maximum of five years, from export charges

and duty payable by exporting enterprises, and from import duty, charges and tax on intermediate products incorporated in the manufacture of exported products. Where agreed enterprises are concerned, a stabilized tax regime for direct taxes, and even additional benefits may be granted as part the agreement and may last for up to ten years. It should be pointed out with regard to these incentive measures that the Code grants additional benefits to promoters who come under the regime of decentralized enterprises. The tax exemption for such enterprises located outside Bujumbura may last for up to ten years, and the State may defray the difference in the cost of water and power over and above their price in the capital. The State may also make free grants of land to promoters. In addition, these promoters may pay profits tax at a rate of 35% after the exemption period.

It is too soon to assess the impact on the economic development of the country of these benefits for which provision is made in the Investment Code. The new Code has only been in force since 1987. The factors of technology transfer are not yet being embodied in the analysis and assessment of investment projects. In that respect, the lack of criteria for technological analysis and assessment is depriving the National Investment Commission of means for the promotion of technologies that meet the country's needs. The promoter does not, in fact, feel any incentive to invest in technology on the local market. An attempt will be made in the next section, when dealing with institutional aspects, to pinpoint the factors that could improve this situation.

B. Institutional framework and supporting machinery

Every decision to import technology and to adapt it to the local conditions, or to develop it locally, whether it be taken by the public sector, or by the semi-public or the private sector must of necessity have an institutional framework. On the surface, it appears that the decision-taking process is generally quite a simple one, proceeding from the idea, the preparation of the schedule of conditions, the production of the plan, the negotiations and the process of acquisition, and lastly the installation and use of the technology. However, the bodies that are involved in the decision-taking process and the supporting machinery for the carrying out of the decisions are at levels that differ depending on the status of the purchaser of the technology, i.e. on whether the purchaser is in the public or the private sector.

It may be pointed out that project development in the public sector is entrusted to the appropriate technical ministry. The respective technical ministries have the responsibility for project ideas, preliminary studies and feasibility studies. To that end, each ministry has, in principle, a project-preparation unit. However, the Ministry of Trade and Industry is empowered to carry out pre-feasibility studies for public or private promoters. Depending on the nature of the project, these studies must contain an analysis of the market, the production process, and the equipment needed. When one is aware of the importance of the basic study, which may at times be decisive for the choice of technology and the approach to be followed, it may be noted that the technical ministries are not in a good position to make an analysis and assessment of the technological aspects of investment projects.

Where the private sector is concerned, promoters often approach a research unit or a public body (CPI) and ask them to prepare a file on the

legal, economic and financial aspects of their project. If they wish to avail themselves of one of the regimes for which provision is made in the Investment Code, they have to submit the file to the Ministry of Planning, which is the office of the National Investment Commission established by the Investment Code.

1. National Investment Commission

Any investment project originating from the public sector or from the private sector for the purpose of instituting or extending activity in agriculture, industry, tourism or transport must, if its value reaches or exceeds the limit set by the Code, be submitted to the National Investment Commission. The Commission is made up as follows: Chairman: drawn from the Ministry of Planning; Deputy-Chairman: drawn from the Ministry of Industry; Members: the Minister with responsibility for Agriculture and Stock Farming; the Minister with responsibility for Taxes and Customs; the Minister of Labour; the Minister with responsibility for the branch of the economy with which the project is concerned; the Governor of the Bank of the Republic of Burundi; the Director-General of the Industrial Promotion Centre; a representative of the Institution responsible for the financing of the project; and a representative of the Guarantee Fund.

As required by the Code, the file submitted to the Commission must pinpoint the legal, economic, technical and financial aspects of the investment project. The Commission confines itself to an analysis of the investment project on the basis of the file submitted by the promoter. In practice, files submitted for approval often deal solely with the financial aspects of the project. It should be pointed out that, given the lack of permanent facilities, the Commission is not in a position to have an overall view of the technological needs of the country either at the global level or at the level of the branch of the economy. In that respect, the Ministry of Trade and Industry, by virtue of the part that it plays within the National Investment Commission and of its attributions as a technical ministry, is well placed to examine the technological aspects of investment files. It goes without saying that, in so doing, it should deal with the following matters:

(i) analysis of the needs of the branch that are to be met both through the importation of technology and through its development within the country;

(ii) assessment of the technological potential of the country in the various sectors and subsectors of the economy;

(iii) information on the sources and means of technology transfer;

(iv) legal measures and instructions for the implementation of investment policies.

Through their intervention in the mobilization of internal resources and investment promotion, the authorities have a great role to play in shaping the acquisition, use and development of technology. The Contract Allocation Board is one such body that could influence technology transfer in the country.

2. Contract Allocation Board

The Board is an administrative body that has no structural connection with the technical ministries. In principle, its role is to coordinate the

purchase of equipment and services by ministries and by public bodies. It should be noted that the Specifications currently in force were promulgated on 27 April 1987, and abrogated the Decree of 25 February 1959 and the Organic Royal Order of 26 January 1959 on public works, supplies and transport. However, the present Specifications are being reviewed by a Commission instructed to remedy their deficiencies. This would provide an opportunity to insert clauses on the transfer of technology, and guarantees for the supply of maintenance manuals and spare parts, and for the training of national personnel.

3. Industrial Promotion Centre (CPI)

Among the supporting machinery for imports of technology we should refer to the CPI set up by a decree of 5 May 1982. The CPI, which is under the direct control of the Ministry of Trade and Industry, has had the benefit of assistance in its operations from UNCTAD and UNIDO. Its activities are concerned with:

(i) industrial information and documentation, including information and documentation on the food industry;

(ii) assistance to enterprises at managerial level, on accountancy and on legal matters, including contractual aspects, and;

(iii) examination of investment projects.

The fact that the Centre is represented on the National Investment Commission means that it is involved in the taking of decisions on investments.

4. Chamber of Commerce, Industry, Agriculture and Craft

The Chamber of Commerce, Industry, Agriculture and Crafts is another means of support for investment promotion. Its members are essentially the most important establishments in Burundi. CCI is currently being reorganized with the assistance of the World Bank so as to provide a supporting service to assist private promoters with the preparation of investment projects.

C. The current economic situation and its effects on technology transfer in Burundi

Plans for economic development have aimed at job creation on a massive scale, the development of monetary transactions and the marketing of foodstuffs. The forecasts of the last Five-Year Plan (1983-1987) were 80% realized. The positive results have been the extension of the road network and the electricity network, increased industrial production and reafforestation. Despite these results, it has to be noted that there has been a marked deterioration in the general economic situation of the country.

The purchasing power of exports has ceased to cover the cost of the goods imported, mainly on account of fluctuations in the world markets for coffee, tea and cotton (the price of coffee fell in 1987 by nearly 50%). The land-locked situation of the country has also had adverse effects on imports and exports, by increasing import costs and making the products exported less competitive. The Government has introduced a policy of easing restrictions on imports as part of its structural adjustment.

The public foreign debt has risen rapidly (by more than 25.9% in the course of 1987).3/ As a result, the burden of debt servicing has been further increased. Thus, the ratio of the foreign debt to receipts from exports of manufactured goods and services rose from 22 to 59% between 1986 and 1987.4/

As regards foreign aid, it should be noted that it financed nearly 66% of the investment made under the previous plan. The share of loans in foreign aid has quadrupled. It is also evident that the foreign debt has increased during the period of plan implementation. Capital gifts in fact remained at a constant level between 1981 and 1987. Compared with GDP, the total volume of public aid fell from 17% in 1983 to 11% in 1985. In relation to export receipts, public aid amounted to 240% of exports in 1983 and 136% in 1986. There has therefore been a tendency for public aid to decline.

Given this situation, it would be interesting to turn briefly to the macro-economic forecasts of the Fifth Five-Year Plan (1988-1992). In making trade a factor of importance for economic development, the Plan attaches great importance to imports and exports. As regards exports, Burundi would imperatively wish to increase its receipts. In that respect, considerable attention is paid to coffee, the main exported product, with a view to improving quality and increasing the harvest. In order not to be dependent on the receipts from coffee exports, the Plan envisages a strengthening of the marketing and processing of agricultural produce. Thus, it is desired to increase the export share of such manufactured products as textiles, beer, glassware and, above all, agro-industrial products. It appears that regional markets are being targeted. Faced with these forecasts, it goes without saying that increasing importance attaches to the acquisition and use of technology. Nevertheless, it has to be pointed out that Burundi's capacity to import remains very restricted. It is appropriate to add that, in addition to debt servicing, to which reference has been made above, the recurring charges of several major investments must also be taken into consideration because they are quite considerable. For example, there is a lack of spare parts for some industrial machinery. Furthermore, maintenance is also a problem that has a bearing on the effective use of the existing industrial equipment. The food industry case studies that figure in this report will illustrate this state of affairs. There is good reason to note that the measures aimed at reducing imports have considerable repercussions on the acquisition of the parts and other inputs needed for the use of the existing equipment. Having regard to the low technological level of the country, it is imperative to increase import capacity to enable enterprises to ensure a level of operation needed for the development of the country. Furthermore, if the State is successfully to carry out its programme of diversification it must make a special effort to strengthen the basic structures of the economy, to promote productive investment and to give priority attention to manpower training. These factors of the existing situation in Burundi must logically find their expression in the legislative approaches, the practices and the institutional machinery governing the transfer of technology and the promotion of national technological ability.

3/ Bank of the Republic of Burundi, Rapport annuel 1987.

4/ Idem, and more recent information from BRB.

Chapter II

Main characteristics of food production

Burundi is a land-locked country of very rugged terrain in Central Africa. It borders on Lake Tanganyika and lies 1,200 km from the Indian Ocean and more than 2,000 km from the Atlantic. It has a relatively temperature climate, with abundant (900 to 2,000 mm), irregularly distributed rainfall. It has a surface area of 27,800 km^2 and an estimated population of 5,000,000 inhabitants, increasing at an annual rate of 2.65 per cent. It is one of the most densely populated countries of Africa (between 60 and 300 inhabitants/km^2, depending on the province).

Burundi is in the category of the least developed countries. Agriculture, the main activity of the country, accounted for 60% of the GNP in 1985, and is also the main source of employment for 85% of the working population.

Agriculture, usually of the subsistence kind, is practised on small family holdings and plots of no more than 2 ha. Burundi has three seasons: the little rainy season (the "little rains") from September to January, the big rainy season (the "big rains") from February to June, and a dry season in July. The lowlands and marshes are cultivated in August.

The main staple foods are beans, manioc, bananas and maize, sweet potatoes and taro. The cash crops, essentially coffee, tea and cotton, are intended for export. Stock farming plays a not inconsiderable role, but fishing, in Lake Tanganyika for the most part, is an industry of little importance.

A. Agricultural situation

The activities associated with food production are essentially the growing of coffee, of the best arabica quality, on all the central plateaux, but above all towards the North (Buyenzi - Kirimiro); tea in high-altitude cool, well-watered regions (Mumirwa); the traditional, formerly migratory stock farming of the hilly region in the Centre and South of the country (Mugamba - Bututsi); fishing for dwellers on the shores of Lake Tanganyika and the northern lakes; and crops more recently introduced into the colonized lowlands with great technical supervision: irrigated rice, cotton, oil palms, sugar cane, tobacco, soya etc., although they are as yet marginal.

As has been seen, these systems are practised on family holdings that are becoming smaller and smaller: succession through the male line has the effect that the land is divided up on each succession.

1. Food production

Thanks to its favourable climate and relatively dry soil the country has a wide range of agricultural produce. The resources of the 11 natural regions of the country vary and are dependent on such factors as the soils, precipitation and accessibility. The Burundi government has encouraged and promoted the introduction of new crops such as rice, soya and wheat, and has

favoured the establishment of agricultural cooperatives. Despite organizational constraints, food crops occupy 90% of the cultivated area.

Wheat: Current production is 10,000 tons. Although there are only limited possibilities of extending the area under wheat, it will be possible to meet the increasing demand by improving yields from 800 kg to 1.5 t/ha. In the context of its use in the bakery industry and for infant feeding, it would be desirable to retain this grain even should it have to be imported.

Maize: This is the most important grain crop in Burundi; annual production is around 260,000 tons. The development of high-yielding maize, improved soil fertility and plant protection measures will enable needs to be met without having to import.

Sweet potatoes: Annual production is 460,000 tons. Any development is essentially dependent on improved varieties, better plant-protection treatment and prior popularizing campaigns.

Potatoes: Production reaches 35,000 t/yr. Development is dependent on the spreading of varieties resistant to mildew and bacterial disease, in conjunction with improved soil fertility.

Manioc: Production amounts to about 574,000 t/yr. It occupies an important place for reasons of food security and speculation (demand, easy to prepare and easy to grow). Development is connected with the search for new, early varieties that are tolerant, have a better yield and are mild in flavour.

Beans: For this, the fourth-ranking food crop of the country (240,000 t/ha), soil improvement in conjunction with better cultivation is required. Beans are of value as a source of vegetable protein and for the fertilizing properties of the bean plant (nitrogen supply).

Ground nuts: Production fluctuates around 12,000 t. Development will be difficult owing to several unfavourable factors (ecology, storage) and difficulties (processing).

Soya: This is a new crop that has not yet been completely accepted, is relatively costly and has a high food value. Three elements are needed for its development: better promotion of the product, a prior information campaign and an improved range of varieties, and a soya-processing industry (soya flour, soya bean milk, cakes etc.)

Bananas: Burundi produces two kinds of banana: vegetable or desert bananas (450,000 t) and bananas for brewing (800,000 t). Banana growing should be improved to permit the development of catch crops and the extension of vegetable bananas. At the present time more than two-thirds of the production is used to brew beer.

Rice: This is a new and completely integrated crop; the Yunnan-3 variety yields 15,000 t/yr of rice in the husk. The requisites for its development are: on the plain - improved management (soil, water) to intensify production; in the mountains - maintenance of soil fertility and the integration of rice into the cultivation system (two crops in the marshes, and protection against plant diseases, insects and birds).

Sorghum: Annual production is 100,000 t. Sorghum, which is a competitively priced grain that, although of low nutritional value, is complementary to soya, is unevenly established.

Table 1

Agricultural production, 1970-1987

	1970	base 100	1973	base 100	1978	base 100	1983	base 100	1987	base 100
Grain										
Maize	130,000	76	135,800	77	160,000	79	148,000	65	173,100	62
Rice	7,800	4	4,800	3	6,300	3	9,000	4	23,300	8
Wheat	5,000	3	5,100	3	2,700	1	6,000	3	8,200	3
Sorghum	20,000	12	20,500	12	22,000	11	53,000	23	63,000	
Raggee	8,800	5	9,200	5	11,000	6	11,000	5	12,400	4
	171,600		175,800		202,000		227,000		280,000	
Pulses										
Beans	278,700	90	291,100	90	276,300	12	280,000	90	324,400	91
Peas	30,100	10	31,400	10	25,000	8	30,000	10	34,000	9
	308,800		322,500		301,300		310,000		358,400	
Oil-yielding plants										
Oil palms	11,600	56	12,100	52	16,000	63	12,000	45	13,500	43
Ground nuts	6,200	14	7,800	34	6,300	25	12,000	44	14,800	44
Soya beans	3,000	30	3,000	13	3,000	12	3,000	11	3,200	
	20,800		22,900		25,300		27,000		31,500	
Tubers										
Manioc	370,300	18	386,800	18	450,000	20	444,000	20	573,800	20
Sweet potatoes	381,600	18.3	398,600	18.3	564,000	25	502,000	22	628,500	22
Potatoes	34,000	2	35,500	1.6	30,000	1	35,000	2	43,000	2
Taro	96,200	4.4	100,500	4,6	100,000	4.4	100,000	4	126,100	4
Yams	5,800	0.3	6,000	0.3	5,000	0.3	6,000	-	7,200	-
Bananas, as vegetable	440,500	21	460,100	21.2	413,000	18	428,000	19	552,900	19
Bananas for beer	756,500	36	790,200	36	709,000	31.3	732,000	33	932,600	33
Fruit	1,900	2	2,000	2	1,600	1	31,000	21	37,000	20
Vegetables	7,000	7	7,300	7	7,100	7.7	16,000	11	20,700	11
Leaves	39,100	38	40,900	38	42,000	28	51,500	29		
Squashes	50,700	49	52,900	49	51,500	49	53,000	36	65,500	36
Sugar cane	5,000	4	5,000	4	5,000	5	6,000	4	7,100	4
	103,700		108,100		105,000		148,000		181,800	
Food crops total	2,689,800		2,807,000		2,904,600		2,960,000		3,715,800	

Source: World Bank Report, Burundi, Problèmes de développement et d'ajustement structurel, 1988.

Fruit and vegetables: Excluding bananas, fruit production in 1988 is put at about 32,000 tons, or an availability of 6.4 kg per inhabitant per year, which is considered to be very poor. According to an Agricultural Services report, avocados and mangoes jointly account for two-thirds of the output. It should be emphasized that pineapples, passion fruit and papayas are available throughout the year, and that the mango season is from October to March.

Table 2

Fruit production in 1986

Varieties	Tonnages
Pineapples	3,200
Tomatoes	215
Papayas	1,600
Passion fruit	1,200
Oranges	2,800
Lemons	1,600
Avocados	1,200
Mangoes	5,200
Guavas	3,200
Pomelos etc.	350
Total, all fruit	20,565

Source: Information obtained by the combined mission. See also Annex 3.

2. The part played by coffee, tea, cotton and sugar

Industrial plantations, mainly growing arabica coffee, tea, sugar cane, cotton and oil palms, occupy no more than a few thousand hectares. Given that they are worked by the most modern techniques, they are accompanied by food industry installations for the on-site processing of their produce. Two modes of production therefore co-exist in Burundi, one of which, the predominant mode, is highly traditional, while the other makes use of up-to-date technology, but both run up against the same obstacles.

Coffee production: Coffee is Burundi's strategic product, accounting, in terms of value, for 90% of the country's exports. Nevertheless, Burundi is a small producer, its share of the world market being less than 1%. The bulk of the output is arabica grown at below 1,000 m, which accounts for about 96% of the total.

Coffee was introduced into Burundi at the beginning of the century by missionaries and the first plantations sprang up around the missions. A programme to spread coffee growing in Burundi worked out by the German authorities was taken over in 1920 by the Belgian administration in Rwanda-Urundi with the intention of securing very widespread cultivation in the villages.

The peasants, who saw this crop as something imposed on them by colonialism, were hostile towards it; they failed to adapt to it, found the care that it required irksome, and saw it more as a form of taxation than as a source of income. The Belgian administration countered by imposing a "poll tax", which had to be paid by every adult, and it is that which accounts for the fact that there are at the present time a great many small plantations that were originally created for the purpose of paying this tax.

These colonial impositions enabled the planters to integrate the trading system as it then existed right down to the Second World War, when the extension of the plantations was prohibited so that the people should pay more attention to the growing of food crops to face up to the difficulties of the time.

Following the efforts of the authorities to make this crop a profitable one for the peasant, Burundi has now become a producer whose coffee is held in high repute.

Nevertheless, coffee production does fluctuate considerably, as is shown by the production table.

The uncertainties of production, taken in conjunction with the uncertainties of world rates, make Burundi's reliance on virtually only the one cash crop a source of imbalance in the estimated income of the State.

Burundi, of course, has no control over the fluctuations in rates on the international market, but it should be able to exercise more control over the uncertainties of production. Although regular attention has been paid to coffee growing, there is a continuing need to make small producers aware of the problems of pruning, mulching, manuring and the general upkeep of coffee plantations.

Various policies aimed at quantitative and qualitative improvement of the product have been undertaken in close collaboration with OCIBU, ISABU and the Ministry of Agriculture: the establishment of nurseries, the distribution of plants, control of the pests and diseases of the coffee tree, and the creation of a pulping and hulling station.

Table 3

Coffee production, 1984/85 - 1986/87

	1984/85	1985/86	1986/87
Total	27,005	32,494	31,299
Arabica	25,272	31,295	30,292
FWAAA	165	1,140	366
FWAA	722	630	2,046
FWA	765	1,285	1,762
OCIRU 2	4,545	9,359	11,646
OCIRU 2A	2,726		
OCIRU 3A	10,066	8,687	6,906
OCIRU 3B	4,735	7,905	4,834
OCIRU 4	1,146	1,511	2,334
OCIRU 5	368	734	361
HTM + B	34	44	37
Robusta	1,733	1,199	1,007
Washed	589	448	645
Natural	1,144	751	362

Source: World Bank Report, Burundi, Problèmes de développement et d'ajustement structurel, 1988.

Every coffee harvest results in the injection of a not inconsiderable amount of money into the rural environment, but it is fairly unevenly distributed from region to region.

Despite the absence of food-industry crop specialization in Burundi, coffee is grown everywhere, but the yields vary by as much as 100 per cent (climate, altitude, age of the coffee trees etc.).

Tea production: At the end of 1987, tea was being grown on an area of 6,229 ha in Burundi, of which slightly more than one-third was industrial plantations and 66.4% was small familiy holdings. The plantations are relatively young: more than seven-tenths were planted after 1970. Production is continuously rising as the oldest established plantations reach maturity and as extensions to peasant holdings begin to yield.

The total output of marketable tea from the Teza, Tora, Ijenda and Rwegura tea factories in 1987 reached 4,282 tons. The contribution made by small family holdings has tended to increase, rising from 33% in 1981 to 45% in 1984. The average yield from all plantations reached 703 kg of marketable tea in 1987, but is still low, because the plantations are young. Yields are also higher in the northern tea-growing sector, owing to the higher soil fertility.

Table 4

Yields obtained in 1984 on industrial plantations and on small family holdings (in kg of marketable tea per ha)

	Northern sector	Southern sector
Industrial plantations		
Teza	1,417	
Rwegura	1,127	
Tora		459
Small family holdings		
Remura	783	
Muramvya	564	
Gisozi		358
Ijenda		367
Tora		439

Source: Burundi Tea Office, Rapport annuel, 1984.

Table 5

Tea production/export and production costs, 1984-86

	1984	1985	1986
Cultivated area (ha)	4,921	4,921	5,087
Small holdings	3,178	3,178	3,287
Plantations	1,743	1,743	1,800
Green tea production (tons)	15,313	19,066	16,753
Plantations	8,458	9,016	7,435
Teza	3,763	3,397	3,112
Rwegura	4,012	4,562	3,262
Tora	683	1,057	1,061
Small holdings	6,855	10,050	9,318
Production per hectare	3,112	3,874	3,293
Dry leaves (tons)	3,445	4,145	3,597
Teza	1,303	1,320	1,193
Rwegura	1,226	1,290	823
Tora	686	754	898
Green leaves/dry tea	4.4	4.6	4.7
Exports (tons)	3,344	4,116	3,449
Price to the producer			
Planters	15	18	18
Villagers	5	5	5
Price ex works (FBu/kg) for dry leaves			
Dry leaves	37.6	59.7	70.5
Factory costs	26.4	37.3	36.7
General costs	50.1	50.1	72.3
Depreciation	25.0	26.6	31.3
Sub-total	139.1	174.3	210.8
Marketing costs	44.5	46.7	49.9
State tax		11.5	
Total	183.6	232.5	260.7
Average export cost	281.1	175.0	148.4

Source: World Bank Report, Burundi, Problèmes de développement et d'ajustement structurel, 1988.

A purchase price for leaf tea that is an incentive for the spread of better cultivation techniques among the peasants and the use of nitrogen fertilizers are the main factors that will make possible a considerable increase in the yields of tea holdings.

Cotton production. Cotton was introduced into Burundi at the same time as coffee; by 1959 the production of cotton seed had reached around 10,000 tons. Following an abrupt decline, cotton growing has decreased regularly, despite some upsurges in recent years, as can be seen from the following production table.

Table 6

Cotton production in Burundi, 1984-1986

Year	Cotton seed	Cotton fibre/t	Sown area/ha
1984	6,536	2,325	6,496
1985	7,155	2,583	6,595
1986	7,894	3,155	6,688

Source: Annuaire statistique, 1986.

Production of sugar cane: This crop, which has been established in the Moso region, will satisfy the country's needs. Imports in 1984 amounted to 10,000 t; the production envisaged for 1990 is 15,000 t.

3. Stock farming and fishing

The other sectors of agriculture include stock farming and fishing. Stock farming is developing apace. Census data and estimates from 1988 yield the following figures.

Table 7

1988 stock-farming estimates

Species	Numbers	Weight of carcasses, t	Per capita availability, kg	Proportionate share, %
Cattle	400,000	4,400	0,9	20,4
Goats	1,000,000	5,400	1,1	25
Sheep	400,000	"	"	"
Pigs	130,000	4,300	0,85	20
Poultry	3,000,000	7,250	1,45	33,6
Rabbits	70,000	210	0,04	1
Total, all species	5,000,000	21,650	4,3	-

Source: Information obtained by the combined mission. See also Annex 3.

The following are the main constraints noted in the situation:

- efforts to develop stock farming are limited to animal health and do not comprise any significant element of animal production;

- although current developments are conducive to production, they lack any guiding line and overall plan, with the result that operations are fragmentary, disparate and disorganized;

- the absence of any contribution from State farms to the development of the stock farming sector;

- the inability of the technological and industrial machinery to cope with the production that is taking place and with the various levels of the market (consumers);

- the weakness of the internal market on account of the modest purchasing power of the population.

It is evident from the figures in the production table that the availability of products of animal origin remains very low or negligible for most people. As regards the supply of protein, the 3.3 litres of milk per inhabitant per year is negligible, as is the figure for meat, 4.3 kg per person per year, which is one of the lowest figures even by comparison with other African countries.

Fishing, which is a sector of little importance, is confined in the main to Lake Tanganyika. There are three types of fishing in Burundi: commercial (artisan), customary (individual) and industrial, the main difference being in the types of fishing gear used. Commercial (artisan) fishing is conducted from catamarans, each consisting of two dug-out canoes propelled by oars or paddles, or by an outboard motor. There are an estimated 1,000 fishing catamarans. Customary (individual) fishing is conducted from single-hull dugouts, by hook and line and by beach seine. This is fishing of the subsistence type practised by dwellers along the shores of the lake.

Industrial fishing is conducted out on the lake by a motor seiner accompanied by five small boats carrying lamps.

Table 8 below shows production by type of fish and of fishing. The estimated resources are 21,000 tons (maximum balanced annual production), but available statistics suggest that national fish production has fallen sharply from 10,500 to 5,400 t/yr.

4. Some recommendations on fishing and fish products

Appropriate measures need to be taken on the following matters:

* Determination of the level of consumption within the country;

* Determination of the channels of cash and trade flows;

* Improvement in the availability of fish in both quantity and quality by reducing losses after collection;

* Improvement in the conditions for the transportation and storage of fresh and processed fish;

* Analysis of distribution channels and of sale prices in relation to purchasing power;

* Preparation of a plan of action for fishing covering all aspects of fishing itself, fish marketing, preservation, distribution and processing;

* The possible creation of staffing structures for all these operations.

Table 8

Fish production in 1988

Customary fishing	No. of units	No. of fishing trips	Quantity		Value	
E.1	94	12,887	99,453	1.5	7,101,177	1.3
E.2	"	"	579	-	83,455	
E.3	"	"				
Misc. E.4	"	"	85,606	1.3	6,298,969	1.1
Subtotal	-	-	185,638	2.8	13,584,601	2.4
Commercial (artisan) fishing	292	54,163				
E.1	"	"	4,118,607	61.7	343,823,017	59.8
E.2	"	"	3,314	-	368,600	-
E.3			824,055	12.3	74,535,400	13.0
E.4	-	-				
Subtotal			4,945,976	74.0	418,727,017	72.8
Industrial fishing						
E.1	16	3,939	950,660	14.2	65,368,093	0.8
E.2			18,390	0.3	4,812,200	0.8
E.3			571,110	8.6	72,310,900	12.6
E.4			4,890	-	329,050	-
Subtotal			1,545,050	23.2	142,820,243	24.8
Total			6,676,664		575,131,861	100

Source: Department of Waters and Forestry, Rapport annuel, 1988.

Key:

E.1: Stolothrisa tanganicas (Stdr) = Ndagala [Lake Tanganyika sprat]
Limnothrisa miodon (Blgr) = Ndagala [Lake Tanganyika sardine]

E.2: Lates sp. = Sangala [Nile perch]

E.3: Luciolates (Limnothrisa) stappersii (Blgr) = Mukeke [Stappers' sprat]

E.4: Miscellaneous catch

B. Role and contribution of food production

The last Plan accepted a real mean annual growth rate of the GDP at factor cost of 3.7%, and of 4.0% for the GDP at market prices. The growth rate achieved for GDP between 1983 and 1987 was 4.7%. The 4.7% growth of the GDP was strongly supported by the agricultural sector, which showed a mean growth of 4.3%. That growth, however, was greatly influenced by the considerable recovery of agricultural production in 1985 after the drought of 1984.

With regard to the global structure by branches, the primary sector remained preponderant. Its contribution to the GDP at factor cost was 56.6%, with a growth rate assessed at 1.1%. On the other hand, the share of the secondary and tertiary sectors declined from 16.5% and 28% respectively to 14.8% (see table 9).

It is agricultural production that makes the largest contribution to the GDP. Foodstuffs account for about 40% of the GDP; the main products are roots and tubers (manioc, sweet potatoes), pulses and cereals (maize, sorghum and millet). These products are important to the farmers, both for their subsistence and for the cash income that they provide. Export crops such as coffee and cotton account for some 20% of the cash income of the rural population and contribute 6% to the GDP.

Table 9

Contribution to the GDP

	1983	1984	1985	1986	1987
Primary sector	53.5	54.7	56.0	52.5	52.4
River agriculture	39.4	43.4	45.5	40.9	39.6
Export agriculture	5.8	4.0	4.0	4.9	5.8
Other - stock farming, fishing, agriculture	8.3	7.3	6.5	6.7	7.0
Secondary sector	14.5	12.6	11.8	12.1	13.6
Industry	4.5	4.5	4.0	4.4	4.5
Crafts	3.9	3.3	3.3	3.4	3.6
Mining and energy	0.6	0.4	0.5	0.7	0.7
Construction	5.5	4.4	4.0	3.6	4.2
Tertiary sector	25.5	23.7	23.2	25.1	26.7
Private	13.7	11.8	11.6	12.4	12.7
Public utilities	11.8	11.9	11.6	12.7	14.0
Total GDP at factor cost	93.5	90.9	90.9	89.7	9.2
Net indirect taxes	6.5	9.1	9.1	10.3	7.3
GDP at market prices	400	100	100	100	100

Source: Republic of Burundi, Vème Plan Quinquennal de Développement Economique et Social, 1988-1992.

Real growth rates

Primary sector	4.4	-3.6	13.1	4.1	4.3
Secondary sector	3.3	1.5	9.3	1.3	8.7
Tertiary sector	3.4	6.1	11.8	2.8	3.1

The food industries are predominant, accounting for more than 68% of the value added by the manufacturing industries, among which the industries producing mineral waters (and especially the BRARUDI brewery) are preponderant. The industries engaged in the primary processing of agricultural raw materials take only fourth place, after the mechanical engineering and chemical industries, but before the textile industries.

Table 10

Value added by the various manufacturing industries in 1985

Branch of industry	Value added, millions of FBu	As a percentage of manufacturing GDP
Industries engaged on primary processing of agricultural products	730.4	5.9
Food industries	8,244.9	66.5
Textile industries	895.8	7.2
Mechanical engineering	1,271.4	10.3
Chemical industries	1,080.2	8.7
Timber industries	167.9	1.4
All manufacturing industries	12,390.5	100.0

Source: SNES, Comptes Economiques, 1985.

The processing of agricultural products is by far the greatest activity of the industrial sector. It accounts for 6% of the GDP as against 5% for the other manufacturing activities. In the light of the experience of other African countries and in the context of structural adjustment and the stimulation of the industrial sector, the Government has accepted that the directly productive sectors should be given priority. The following results will be aimed at for the specific objectives, on the basis of industrial projects: an 18% annual increase in the GDP of the sector so as to achieve a 12% contribution to the GDP in 1992; strengthening of the sector of small and medium-sized enterprises (SME) by the creation of new units and/or by the stimulation of existing units; job creation by the promotion of highly labour-intensive units, with the creation of some 10,000 new jobs in the course of the Fifth Five-Year Plan; the tapping of locally available resources; measures to ensure the maximum profitability of the enterprise

sector through increased productivity stemming from restructuring and restoration and through firm management; an increase in the share of manufactures to 20% of the value of exports at the end of the Fifth Plan; encouragement of joint ventures to facilitate technology transfer; the training of qualified technicians and managers; the coordination of governmental promotional activities and assistance for existing industries and industries in course of establishment; encouragement for the establishment of industries producing implements and small pieces of equipment for the special purpose of strengthening the complementarity between industry and agriculture; stimulation of private initiative in the context of industrial promotion and development; technological choices compatible with the size of the local and subregional markets.

C. Availability

Studies and surveys carried out within the country show that, with a few exceptions, the population of Burundi does have a balanced diet, but that the balance appears somewhat unstable.

1. Calories available

Appraisal of the availability of agricultural products in 1982 indicates a per capita availability of 2,200 calories, of which 95% is derived from food crops. Food imports account for only 3% of the total supply of calories and are mainly grain products, malt being reserved for the brewing of so-called industrial beer, and oil. It may therefore be concluded that the country is self-sufficient.

For some years past, however, the fact that satisfaction of the calorific requirement has been around 100% indicates a precarious mean balance. The supply of calories from food crops comes from four main categories of product: tubers (32%), pulses (27%), cereals (21%) and bananas (17%).

Despite the diversity of the produce grown, consumption of beans, maize, sweet potatoes, manioc and bananas accounts for 85% of the total calorie supply.

It should be noted that fats are in short supply in the food intake, covering only 7.3% of the calorific requirement, which is far less than the optimum value, put by some experts at 25%.

2. Availability of animal protein

The availability of protein is 67.2 g per person per day, which is 112% of the requirement. However, the proportion of protein of animal origin is low, 7% of total protein. According to a study on the development of stock farming, the availability of all kinds of meat is 4.3 kg per inhabitant per year, and the availability of cow's milk 3.3 litres per inhabitant per year (see also table 11).

The intake of protein comes mainly from pulses (roughly 60%: beans and peas) and from cereals (20%: maize and sorghum). The imbalance in the diet causes deficiency diseases such as various forms of anaemia, vitamin deficiency diseases etc. It should be noted in passing that there are other factors that influence nutritional status: demographic and economic factors, and socio-cultural factors (dietary beliefs and illiteracy).

Table 11

Food and nutrition situation - global indicators 1981-1986

Indicators	1981	1982	1983	1984	1985	1986
Total population	4,280,300	4,397,100	4,520,600	4,649,500	4,782,400	4,922,100
Food production (tons)	3,054,000	3,003,000	2,960,000	3,032,000	3,385,000	3,586,000
of which cereals	227,000	221,000	227,000	224,000	256,000	266,000
beans and peas	324,000	319,000	310,000	259,000	333,000	346,000
tubers	1,090,000	1,073,000	1,088,000	1,174,000	1,218,000	1,336,000
Other intakes, per person, per day (kcal)	114	114	114	114	114	114
Production, per inhabitant						
Kg of product (annually)	714	683	655	652	708	729
Calories per day	2,183	1,087	2,020	1,936	2,135	2,219
Protein (g/day)	71	68	65	57	67	69
Calorific equivalent of total production (million calories)	3,411,000	3,349,000	3,333,000	3,285,000	3,726,000	3,987,000
Total supply	2,297	2,201	2,134	2,050	2,249	2,333
Percentage coverage	107	103	100	96	105	109

Source: SNES, 1987.

Table 12

Food balance (1982-1987)

Line	Calculation	Calories	Total	of which, animal origin	Fats	Sugars
a Requirement (as a percentage of total energy requirement)	-	100	10-15	2.6	10-15	70-80
b Requirement expressed in terms of energy	2 x 144 x a/100	2,144	268	56	268	1,608
c Energy value of one physical unit (2)	-	1	4	4	9	4
d Requirement in physical units	b:c	2,200	67 g	14 g	30 g	402 g
e Availability in 1982		2,144	66,7	(3 g)	17,9	443 g
f Percentage coverage of requirement in 1982	e:d	(103)97	100	21	60	110
g Availability in 1987	-	2,200	67	(3,1 g)	18,6 g	441 g
h Percentage coverage of requirement in 1987	g:d	(103)100	100	22	62	109

Source: IVème Plan Quinquennal de Développement Economique et Social, 1983-1987.

Chapter III

Trade in, storage and preservation of foodstuffs

Subsistence agriculture is the currently prevailing form in Burundi, although it should be recalled that modern agriculture produces for sale. There are a great many adverse factors that militate against domestic trade in foodstuffs in Burundi, among which we may mention inadequate production and the poor quality of the channels of trade for foodstuffs; the absence of access roads and suitable facilities, the lack of a storage system, the relatively undeveloped methods of preservation and the limited distribution channels, and relative price instability. The following tables give the values of Burundi's imports and its exports of foodstuffs for the years 1983-1987 and 1981-1986.

According to the small amount of information obtained, the trading system in Burundi is relatively little organized. There are two types of operator in the market: a few traders and a large number of producers, who frequent a single market and have only one product to sell. There are very few middlemen, and supply is extremely divided up. Most of the sellers (some 70 %) in some markets are also producers who sell small quantities (e.g. a few kilos of pulses or a hand of bananas). The producers and the retailers live in the hills within a radius of 20 km and do not visit more than one market on foot.

In the capital, Bujumbura, most agricultural produce is sold by retailers who obtain their supplies from producers or from other retailers. The trade in agricultural produce is primarily retail trade; wholesale trade, which is less developed, is confined to a few products such as beans. Some large consumers obtain their supplies by inviting tenders from traders, who succeed in cornering fairly large quantities. Thus, the flour-milling and rice-processing industries have been able to obtain maize and unhusked rice (paddy) through traders, who have been able to make rapid delivery of several hundred tons. According to some other sources, the storage of large quantities would be undertaken not by large traders themselves, but rather by other subcontractors of the collectors in the producing regions in response to the pattern of orders and the state of the market.

The lack of organization, the lack of transport facilities, the almost total absence of an information network, and the losses in storage that are features of the trading system greatly limit its efficiency. Taken together, these factors appear to explain the high profit margins, the price instability and the low incentive for producers to produce a regular surplus. Whatever region is considered, most of the flows converge on Bujumbura, which is the largest and safest market. Trade is mainly in beans, maize, sorghum, manioc and bananas.

A. Aspects of the food trade

1. Food crops

Cereals: The supply of cereals comes mainly from three sources: food aid, national production from locally-produced raw materials, and from imported raw

materials for some doubly processed products such as wheat flour. Frequent interruptions in the supply of imported wheat, of which some 13,000 tons are imported, led in 1984-1985 to the halting of activity at the Muramvya flour mill, which, it may be recalled, was set up in 1980 with a manufacturing capacity of 10,000 tons of wheat and 8,500 tons of maize and storage capacity for 3,000 tons of wheat and 1,900 tons of maize to process the local production.

Because of supply difficulties connected with trans-shipment between Dar es Salaam and Kigoma, taken in conjunction with the time that elapses between the placing of orders and arrival at Bujumbura, which is often considerable, the quality of the goods usually deteriorates and the regularity of supplies becomes highly problematic. Purchases of local wheat remain small.

Following these difficulties, the Government asked ONIMAC to import flour.

As regards maize, it is estimated that 20% of the annual production of 150,000 tons is consumed fresh and that the rest is stored on the cob in grain lofts. Inter-regional trade in maize would appear to be quite small, of the order of 5 to 10%, most often of corn on the cob. There is a real demand. Furthermore, consumption of maize flour is on the increase. Maize costs less than beans, but more than manioc. By contrast with wheat, the manufacturing capacity of the flour mill is rarely fully taken up and remains under-used.

Where rice is concerned, it is processed on the spot by a rice-processing factory, which has serious marketing problems, in addition to its limited processing and storage capacity. The market is partly supplied by rice smuggled in from Tanzania, which competes with the output of the rice-processing factory. An extension of the installations was envisaged to deal with this problem.

The other cereals - sorghum and raggee - are produced in small amounts, and only sorghum is used in any significant quantity in brewing.

Pulses: Beans are the most marketed of the pulses, the proportion marketed being 20%; the greater part of the crop is sold in the markets or stored on the farm. The harvest is, however, irregular owing to difficulties connected with the sensitivity of beans to climatic variations and to plant-protection problems. Soya and ground nuts, which take second place after beans, are produced in small quantities, despite efforts to utilize them by MUSALAC (soya) and ARASOL (ground nuts).

Tubers: The tuber mainly encountered is manioc, the dominant product, which is sold fresh or after craft-industry processing, and which could be the object of industrial processing. The processed products include boxed dry manioc and tapioca flour. Very little is marketed as flour, because of its poor keeping properties. When converted to granular form it keeps better, and dishes made from it are greatly liked by the people for their taste and appearance. Lack of land remains the principal constraint on production. Other, no less important constraints are especially connected with the problem of manpower and the availability of fertilizer, and with other marketing difficulties. Drying and storage are still problems at the processing level.

Table 13

Structure of imports

V: in million FBu
Q: in tons (net weight)

	1983		1984		1985		1986		1987	
	Q	V	Q	V	Q	V	Q	V	Q	V
Production goods	143,752	7,073.2	167,093	9,579.0	156,823	9,295.9	162,712	9,092.6	161,642	9,725.4
intended for:										
metal-working industries	11,817	787.1	12,341	955.3	9,226	813.2	10,455	957.8	13,260	1,376.7
agriculture	4,222	348.1	7,043	556.1	2,129	184.2	8,376	809.3	5,083	739.5
food industries	23,661	1,116.9	17,664	1,044.8	31,712	1,760.5	19,510	1,115.1	18,723	1,019.9
textile industries	531	63.1	541	56.6	809	90.1	736	112.4	495	99.6
building industry	65,681	1,086.6	70,111	1,747.6	57,604	1,130.7	66,770	1,217.6	63,336	1,226.9
timber industry	735	59.4	483	42.4	510	53.7	266	28.6	249	21.6
paper and graphic arts industry	475	65.6	435	54.9	502	82.1	1,105	213.0	798	150.0
leather industry	1	0.4	3	2.1	13	5.2	1	2.7	10	5.8
intended for various sectors of production:										
chemical products	2,581	187.2	2,519	306.6	2,911	437.0	2,728	534.8	3,986	437.3
solid fuels	10	0.5	2	...	28	1.1	1	0.4	10	1.1
mineral oils	38,088	2,660.2	50,914	3,929.8	45,876	3,896.0	46,537	3,055.0	51,142	3,549.8
other goods	5,950	692.1	5,037	882.8	5,503	842.1	6,227	1,045.9	4,550	1,097.2
Capital goods	12,201	5,566.9	13,070	6,525.2	17,267	7,604.7	11,607	7,203.5	12,760	9,443.7
boilers, machinery, mechanical equipment and apparatus	1,889	1,702.5	2,164	1,651.2	3,428	2,830.1	1,783	2,249.1	1,785	2,478.8
spares and machine tools	4,638	765.6	4,268	1,031.3	8,391	1,094.1	4,329	806.3	5,070	1,321.7
electrical equipment	2,145	1,157.4	1,919	1,239.8	2,133	1,168.6	1,788	1,249.6	1,837	1,913.7
tractors, goods vehicles and other spares	2,909	1,350.4	3,455	1,969.9	2,400	1,710.6	2,838	2,278.1	2,835	2,928.2
other goods	620	591.0	1,264	633.0	915	801.3	869	620.4	1,233	801.3
Consumer goods	35,869	4,434.8	45,050	6,278.8	42,695	5,853.7	57,065	6,898.4	53,243	6,971.3
Durables:										
textiles	7,179	2,134.7	7,689	2,953.6	7,070	2,416.4	7,363	2,950.9	7,693	3,596.7
vehicles	3,086	576.2	3,509	608.0	3,860	628.3	3,492	637.7	2,598	518.1
other goods	623	255.4	565	288.3	636	291.9	823	481.9	1,076	667.2
	3,470	1,303.1	3,615	2,057.3	2,583	1,496.2	3,048	1,831.3	4,019	2,411.4
Non-durables:										
foodstuffs	28,690	2,300.1	37,361	3,325.2	35,616	3,437.3	49,702	3,947.5	45,550	3,374.6
pharmaceutical products	24,860	1,388.2	32,598	2,188.8	30,944	2,058.1	43,684	1,848.5	41,139	1,761.7
other goods	345	422.4	413	531.6	693	735.8	827	1,233.6	634	838.6
	3,485	489.5	4,350	604.8	3,979	643.4	5,191	865.4	3,777	774.3
TOTAL (1)	191,822	17,074.9	225,213	22,383.0	216,785	22,754.3	231,384	23,194.5	227,645	26,140.4

Note: (1) Not including electric current, money and personal items.

Source: Bank of the Republic of Burundi (BRB), Customs declarations, 1987.

Table 14

Structure of exports
(millions of Burundi francs)

	1981	1982	1983	1984	1985	1986
Primary products						
Coffee	5,994.4	7,061.4	6,542.1	9,930.1	11,354.0	17,057.0
Tea	211.9	255.3	227.7	863,9	711,7	515.0
Others	588.0	583.0	521.0	475.0	664.0	630.0
Manufactured products						
Cotton fabrics	19.0	30.0	22.0	247.6	420.0	428.0
Bottles	-	-	-	48.3	197.7	193.0
Beer	9.6	95.9	61.7	103.9	11.3	126.6
Others	160.6	131.7	111.1	140.5	87.4	333.0
Other exports	9.9	12.8	10.3	19.3	16.1	23.4
Total	6,744.3	7,900.6	7,486.0	11,825.0	13,280.0	15,585.0

Source: Annual report of the BRB, 1985.

Fruit and vegetables: We shall lay stress only on fresh fruit from the point of view of trading. It has to be acknowledged that trading in produce that is known to be highly perishable is not made easy by zones that are difficult of access, in which there is no regular trading traffic, and in the absence of information on prices. As regards inter-regional exchanges and the supplying of urban centres, it may be suggested that the former are very small. Only the supplying of the capital has given rise to significant trade flows on account, as already stated, of the regular trade traffic to the capital.

The marketing conditions are not very favourable to either the producer or the consumer. There are defects in the technical facilities for the handling of produce and its presentation for sale, and in transport facilities both for the produce and for security operations, and even as regards the healthiness of the produce.

On the economic level, the confrontation between supply and demand occurs under conditions that rule out a proper assessment of the state of the market and, even more so, the establishment of quotations as a contribution to the transparency of the market.

Because of the low productivity and the large number of operations involved in the marketing of fresh produce, prices are at a generally high level.

Through lack of adequate facilities for the preservation of produce, prices fall to varying degrees when supply exceeds demand. From the point of view of preparation for sale, it is to be noted that there is no product packaging. Produce is transported in bulk in sacks or baskets.

The rise in the consumption of fruit is bound to contribute to a more balanced diet for the people. This increase is coming about because distribution is being carried out under more satisfactory technical and economic conditions. Although the export market ought not to be seen as an outlet for surpluses on the domestic market, or as an outlet competitive with the export flows of merchandise, there is a synergism between the export market and the domestic market that should be as well adapted as possible to the conditions of the country. Fruit such as the bananas used for brewing and in cooking are essentially intended for consumption by their producers.

Palm nuts, on the other hand, which are treated in this study as a fruit, can be pressed to obtain the oil known as palm oil. The amount of oil obtained varies with the ripeness of the fruit. The oil palm yields two kinds of oil: palm kernel oil and palm nut oil. Apart from the oil palm plantations around the Rumonge factory, there is a very small trade flow in nuts, and more so in the oils. The main problems encountered in trade in these oils are at the packaging level.

On the export level, fresh passion fruit are the only fruit with any significant export potential. The FRUITO company, a local company specializing in the production of maracudja [= passion fruit] juice, which has a capacity of 80 litres per day, operates for two hours a day and is planning an extension, but the problem that will have to be solved will be ensure an adequate supply of fresh fruit through the development of its fruit-gathering network. The other companies, La Légumière, the Agricultural Company of the Burundi Breweries (SAB), FRCO and NAHV, also plan to diversify their activities by exporting other products. Along the same lines, SOSUMO (the Moso Sugar Company), which has considerable steam-generating and energy-generating capacity, plans to develop other products.

2. Export crops

Coffee: More than 85% of the country's foreign-currency earnings are derived from coffee alone. The recent development of world prices has proved to be unfavourable, and has led in the coffee-producing countries in general to a decline in the level of receipts and in the capacity to finance development. This situation is compounded by problems to do with the marketing of coffee and with its outward conveyance. The Government has done its utmost to concentrate on the high-altitude and middle-altitude zones, which had up to then been the zones best able to yield a return on the means employed; the need to improve coffee quality has been fully recognized and will be strengthened by the building of other washing and hulling plants, as well as by improvements in the trading system and in conveyance to the exporting ports. In general, in-depth studies should be carried out before launching any coffee-growing schemes.

Another constraint that has arisen from the easing of restrictions on the coffee trade by the International Coffee Organization (ICO) will probably have adverse effects on marketing. In order to compete with the quantity and quality of the coffee produced by such major producing countries as Brazil and Colombia, the authorities will have to get down to quantity production of high-quality coffee, by seeking to replace the old coffee plantations and by increasing the density of the highly productive zones. The State will have to continue to distribute young coffee plants free of charge through its various bodies to peasant farmers and to ensure the supply of plant-protection products.

Another constraint that still persists is the traditional practice of selling hulled coffee at a discount. There is a need for some farmers to break the habit of mortgaging their young plantations for small amounts of money during hard times.

The State must periodically review the price paid to the producer so as to maintain it at a level that will encourage producers to improve their output in both quantity and quality.

The State must also revise the sliding scale in the light of the new situation and take account of all the investments and operating costs of the coffee network.

In the face of all these constraints, the marketing system, which had serious deficiencies connected with a single body, OCIBU, that had the monopoly, and that applied a cost-plus price in the context of a sliding-scale price system, offers no incentive to middlemen to operate efficiently.

Tea: Tea, the production of which is supervised by OTB, comes after coffee. The bulk of the tea is exported. Exports rose by around 27% per year between 1980 and 1985. Faced with the fall in world tea prices in 1986, OTB adopted a marketing strategy that concentrated on high-quality tea. According to the officials in charge, the matters that currently need to be tackled are concerned with the cost structure and efficiency of the industry, and with the feasibility of passing on to the producer some costs financed by OTB, in particular the cost of such agricultural inputs as fertilizers. OTB is afraid that there will be less incentive for production if the factors of production have to be financed in whole or in part by the farmer.

Cotton: Cotton producers receive advice and inputs from COGERCO against purchase of the guaranteed yield at sales points that are most often located near the road so as to facilitate transport. Some 50% of the output is disposed of on the world market, and the remainder is sold to the local textile factory, COTEBU, which is under an obligation to buy the cotton fibre from COGERCO at a price 10% above the cost price.

This obligation to buy the fibre at a higher price runs the risk of adversely affecting its ability to compete with comparable imported goods.

3. Products of animal origin

The meat trade is carried on by butchers who buy animals locally in the markets and have them slaughtered in the Bujumbura abattoir.

It remains understood that there is much illicit slaughtering of goats, sheep and pigs, but very few cattle. There is a serious risk of contamination from these practices.

Fish, on the other hand, is sold on the beaches all along Lake Tanganyika and in the city of Bujumbura. The quality of the fish produced is such that it is not very suitable for freezing or for the method of smoke curing introduced some time ago by SOPOBU, which has had to be abandoned because of the high cost price.

It will be noted that the amount of fish available on the market has declined, possibly on account of the pollution of the lake, false declarations and overfishing.

Milk is sold in liquid form by two companies: the Central Dairy and Produlait. These two companies pick up milk from the producers and mix it with dried milk reconstituted from imported ingredients, pasteurize it, standardize the fat content at 3%, homogenize and pack the milk and distribute it to the various sale points in the town.

B. Storage and preservation

Storage is the essential regulatory element of the supply system. There are four different levels in Burundi: (i) storage in the fields (at the farm principally for tubers and especially manioc); (ii) loft storage by peasants; (iii) storage by private traders; (iv) storage by State enterprises (flour mill, rice-processing factory etc.).

In this section we shall not discuss losses due to bad storage conditions, but shall consider the existing theoretical storage capacities. The former company SOBECOV has a storage capacity of 22,000 tons. Agricultural services have a storage capacity of approximately 8,000 t, 50% of which is used to store fertilizer and coffee. The cooperatives have storage facilities for 5,000 t, the quality of which varies from region to region. These buildings are, in general, already partly in use and are not equipped to store food products for long periods.

To sum up, the public storage capacity is of the order of 60,000 t, which is more than adequate. It may be mentioned that the facilities of SOBECOV are currently empty and that the mission did not visit them. We were informed that, subject to a few improvements, they could be used for long-term storage. We recommend that a study of storage should be made with a view to reducing losses at the various levels, and that consideration be given to the feasibility of regulating supply through the processing of local foodstuffs (on-farm processing of some products, manioc and maize, improvement of storage and drying methods at the peasant, craft industry and semi-industrial levels, and a study of presentation and packaging).

C. Some recommendations

The Government's development aims include the concept of food security (i.e. ensuring adequate supplies to cover nutritional needs and to keep imports to the minimum, while avoiding food shortages and an interruption in supplies) and the need to increase both the output and the quality of export crops while increasing farmers' incomes and encouraging the local processing of agricultural products.

The mission noted a certain number of constraints at the following levels:

Inputs: (i) Fertilizers: lack of coordination of activity in the marketing of fertilizers at national level; (ii) Agricultural implements: limited nature of the domestic market, lack of foreign currency; (iii) Seeds: weakness and dispersed nature of the seed supply system.

Food crops: (i) Wheat: the difficulty of promoting wheat production owing to the wish of farmers to ensure their own food security and the ineffectiveness of the pricing policy; (ii) Rice: an unsaleable surplus.

Export crops: On the other hand, farming for sale has witnessed a significant increase in output (20% as against -6.2%) following the renewal of coffee

plantations. Receipts from exported produce and especially coffee have, however, declined, owing to the fall in coffee prices on the world market.

Cooperatives: A lack of managerial staff with training in book keeping.

Regional development companies: Financial deficits and lack of private investment participation.

Private traders: Lack of information on traders, lack of traders with training in commercial book keeping; restriction on access to credit for the marketing of some products; high taxes on goods vehicles; storage difficulties related to the storage facilities themselves; high taxation on annual income.

Trade credit: lack of expertise in the efficient allocation of the available funds.

In the light of the constraints identified above, the mission makes the following recommendations:

Inputs: (i) Fertilizers: A committee should be established to coordinate the activities of the Government with those of the private sector in the marketing of fertilizers, and representatives of the various departments and ministries concerned should serve on it along with representatives of the private sector. This committee would meet on a fixed date to prepare and discuss solutions to trading problems; (ii) Agricultural implements: The requirement for agricultural implements has to be met by the local production of tools and by the importing of high-performance agricultural implements. In particular, the collaboration of the Advisory Service of the Ministry of Agriculture and Stock Farming should be sought in order to identify and promote the use of new implements, as a contribution to their marketing by the private sector; (iii) Seeds: The formulation of a seed-growing plan clearly defining the aims and strategy, and the material and manpower resources required.

Food crops: The economic policy of avoiding intervention in the fixing of prices and the marketing of food crops should be maintained. The Government will be in a position to improve the incentives for increased commercial production by providing farmers with new methods and more effective farming techniques: (i) Wheat: An examination should made of prices and incentives at each stage in the production/importation and processing cycle to assess their influence on national cereals production and consumption. A clear statement should be made of the institutional measures taken to stipulate the policy for the nutritional survey and to monitor its application; (ii) Rice: There is scope for a closer analysis of the conditions of the market in rice, having regard to the most important factors, especially imports from Tanzania, the stock position and the production of substitutes before arbitrarily fixing a price for unhulled rice other than the price resulting from the supply of the product and the demand for it.

Export crops: Measures should be applied progressively in the medium term for the purpose of bringing about a more equitable apportioning of the fluctuations in world coffee prices between the various agents.

Cooperatives: A management consultancy system should be set up to help primary producers' cooperatives and unions; use should be made of short-term missions of assistance with training and retraining at provincial level and the impact

of this training should be assessed and periodically monitored in relation to operation, management, economic results and participation.

Development companies: They will have to attempt to attract the participation of the private sector in their trading operations, in particular the production of rice, the processing of coffee, and the production of palm oil.

Private traders: Constraints should be reduced and better performance by those involved in trading should be made possible on, for example, the following matters: (i) information: the gathering, analysis and dissemination of data on prices for agricultural products; (ii) training: in commercial book keeping; (iii) working capital: an extension of the facilities for access to credit for the marketing of products other than coffee; (iv) transport: the setting of taxes on commercial goods vehicles after a study of the average profitability of these vehicles; (v) storage: the carrying out of a survey on the conditions of product storage all along the line from storage by the producers to the retailers, having regard to the various middlemen. The preparation of recommendations on the investment needed, also having regard to the potentialities of the various marketing agents.

Credit for the trade sector: It is recommended that personnel be given specialist training in the preparation of investment projects suited to the real economic needs of the marketing agents.

Chapter IV

Technology and the food industry in Burundi

A. General survey of the food industry

The country's industrial sector is a very modest one, with no more than a few industrial enterprises, which include the food industries (dairies, breweries, flour mills, oil-producing plants etc.), and a few textile, chemical, metallurgical, timber and other industries.

Let us recall at the outset that the aim of the food industry is to impart greater added value to agricultural products. As in other developing countries, the food industry in Burundi dominates the industrial sector, providing (with the exclusion of coffee and tea) 59% of the total value added of the manufacturing sector and 17% of the jobs in the sector. This branch of activity is itself dominated by the Brewery (BRARUDI) which provides more than half the value added in the food industries. The industry is relatively undiversified and heavily dependent on the outside world, and inter-industry exchanges are very small or even non-existent. It remains obstructed by the following obstacles:

- excessive use of imported raw materials, machine tools and spare parts;
- very marked technological dependence on the outside world, with most of the equipment not very suited to the products to be processed or to the size of the market;
- a very small domestic market for food products;
- heavy concentration in the capital, Bujumbura;
- the finished products exported and the raw materials have to be routed through Kiguma and Dar es Salaam, which results in high costs and is very time-consuming.

Because the enterprises engaged on the primary processing of agricultural products (more specifically, tea, coffee and cotton) dominate the industrial branch, the agro-industrial sector is in the lead.

1. Main categories of food industry 5/

The sector is subdivided into three main categories: (i) the industry based on cash crops; (ii) the import-substitution industry; (iii) breweries and other industries.

The industries based on cash crops are represented by two coffee factories and four tea factories that work mainly for export and bring in around 90% of their income in foreign currency. The Cotton Management Company (COGERCO), which is more specialized on textiles, supplies cotton seed for the production of cottonseed oil.

5/ Annex 1 of this document lists the main industries visited.

The industries handling cash crops carry out the primary processing. Products with higher added value, such as soluble coffee and tea in tea bags, have not yet been tried owing to the competition of the multinationals such as NESTLE and the consequent difficulties in finding markets for these products. All the industries in this category are in public ownership.

The import-substitution industries are represented by the Moso Sugar Refinery, the Muramvya Flour Mill (wheat and maize flour), two dairies, two pasta-producing units, one unit producing maracudja [= passion fruit] juice, three oil-mills (groundnut, cottonseed and palm oil), a margarine factory, a rice-processing plant, two baby cereal factories, and bakers and confectioners of the craft-industry type.

Although the import-substitution industries are dominated by the public sector in terms of the volume of investments, they include quite a few private enterprises that were set up, in the main, since 1980 and are predominantly of medium size. Roughly a half of the enterprises referred to above work mainly on imported raw materials. Those that do use local raw materials have reported that supplies were inadequate.

The breweries: There are two: the Bujumbura Brewery (BRARUDI) and the Gitega Brewery (BRAGITA). These breweries are very modern industries. Roughly 80% of the raw materials that they use are imported.

They are beginning to have an influence through the related industries that have been created: a glass works, a bottle-cap plant and a unit turning out plastic crates, as well as through integration with SOSUMO (the Moso Sugar Company).

These three categories of industry appear to have certain points in common: (i) all the equipment used in the branch, as elsewhere in the industrial sector in general, is imported; (ii) industrial integration remains weak; (iii) all units, except for BRARUDI are working at below their capacity; (iv) the training of peasants, with whom purchase contracts are concluded, with the ensured collaboration of ISABU and the regional development companies (SRDs) appears to be a solution to the problem of obtaining raw material in the quantity desired; examples are BTC, FRUITO, and MUSALAC for soya.

It is appropriate to add here matters relating to the sale of processed foods. As previously mentioned, the Burundi domestic market for foodstuffs, cattle feed, mineral waters and other products of agricultural origin is a very limited one. The trading structure is similar to that of other African countries, namely imports of a very wide range of processed products, but generally in small amounts, and exports of a few processed primary products (coffee, tea, cotton etc.), but in considerably larger amounts.

Table 15

Recent trends in the production of the agro-industrial sector

Enterprise	Product	Capacity	Production 1982	1983	1984	1985	1986	1987	1988
1. BRARUDI	Primus beer	1,000,000 hl/yr	683,913	644,304	798,808	796,297	822,818	873,282	963,621
	Lemonade	165,000 hl/yr	123,779	140,572	144,761	126,868	153,171	137,598	
2. BRAGITA	Amstel beer	150,000 hl/yr	-	-	-	14,117	48,683	58,108	84,791
3. OCIBU	Coffee	41,500	20,285	35,999	27,024	32,494	32,486	37,000	36,243
4. OTB	Tea	5,600 t/yr	2,178	2,334	3,445	4,145	3,597	4,382	5,976
5. Muramvya mill	Flour	15,000 t/yr	2,606	5,204	4,420	7,809	5,090	6,203	
6. RAFINA	Cottonseed oil	1,000,000 l/yr	365,000	277,299	299,853	346,133	601,742	534,882	602,314
7. FABRICHIM	Biscuits	50 t/yr	-	-	-	-	12.4	19.5	N.A.
8. FRUITO	Passion fruit juice	400,000 l/yr	-	-	-	-	-	27,805	79,200
9. SOSUMO	Sugar	15,000 t/yr	-	-	-	-			4,657
10. Palm oil mill	Oil	3,000 t/yr	-	-	-	-	55.5	184.5	N.A.
11. Central dairy	Milk	3,600,000 l/yr	1,480,772	1,701,724	1,508,062	1,316,636	1,530,765	2,016,479	1,798,246
12. Bujumbura rice plant	Polished rice	8,500 t/yr	3,282	3,140	3,538	3,346	3,300	4,382	3,328
13. ALCOVIT	Foods	-	-	-	-	-	-	826	2,231
14. ARASOL OIL	Groundnut oil	-	-	-	-	N.A.	N.A.		
15. Bakeries	Bread	100 million units/yr	41.87	42.08	47.29	47.20	34.35	37.1	
37.1									
16. Produlait	Milk	4,500 l/d	-	-	-	-	-	-	-
17. Impeke	Sorghum beer	900,000 l/yr	-	-	-				
18. MUSALAC		N.A. in tons				20	86	146	388
19. MUTOYI	Jam		-	-	-	-	-	-	-

Source: Ministry of Planning, Study of the efficiency of the manufacturing sector from 1976 down to the present and industrial development strategies for the future. Industrial Organization and Management (OGI), 1987.

Note: The 1988 figure for the production of FRUITO is an estimate. It emerges from the above table that the production of beer continues to increase, while that of mineral waters is stagnating.
Thanks to the efforts being made by the Government, there is some increase in the production of industrial crops (coffee, tea, cottonseed oil, rice). Sugar and palm oil should also increase because of the current and planned increases in their areas.

Table 16

Imports of processed foodstuffs and industrial raw materials (1983-1986)

	1983		1984		1985		1986	
	Q	V	Q	V	Q	V	Q	V
Food industry	23,661	116.9	17,664	1,044.8	31,712	1,760.5	19,510	1,115.1
Perishable foodstuffs	24,840	1,388.2	32,598	2,188.8	30,944	2,058.1	43,684,1	1,848,5

Source: SNES, Annuaire statistique, issues for several years.

Note: Q = quantity (tons); V = value (million FBu)

Table 17

Value of the main exports of foodstuffs (1985)

Product	Value (million FBu)
Marketable coffee	17,000
Tea	514.6

Source: SNES, Annuaire statistique, 1986.

2. The role of foodstuff imports and exports

Imports of foodstuffs have fluctuated widely, depending on climatic conditions and the raw material requirements of the food industry. In the years 1979-1985, they reached an annual average of 55,000 tons, of which about 40% was used by the food industry (flour, malt and a little sugar). Their share in the total imports of goods fell from 21% in 1979 (11% excluding raw materials for the national food industry) to 16% in 1985. Taken over all, imports of foodstuffs represent about 2% of the total food production. The main imported products (see table 16) are wheat flour and maize flour (15 to 25% of the imports of foodstuffs), malt (15 to 20%), sugar (13 to 18%), milk products (6 to 10%) and vegetable oil (2 to 6%). Imported wheat and sugar are important in consumption (they covered 50% of the requirement in normal years).

The country's exports are dominated by coffee, followed by tea and cotton. There is hardly any other country in which a single product bulks so large in the value of national exports. In 1986, for example, the total value of exports is estimated as having been 15,230 million FBu, of which 12,981 million FBu, or 85%, are accounted for by coffee. By comparison with the exports of green coffee, the value of the other products exported is very little. In terms of value, tea and cotton accounted respectively in the same year for 515 million FBu and 20 million FBu, or 3.4% and 0.1%, while beer and

mineral waters alone accounted together for 127 million FBu. The tea and coffee exports are destined mainly for the European market, whereas the various prepared foods go almost exclusively to the local market, with a small proportion for export to neighbouring countries.

Table 18

Balance of payments
(in millions of US dollars - current prices)

Year	Imports	Exports	Balance of resources
1982	258.1	102.6	-155.5
1983	255.7	96.7	-159.0
1984	247.9	101.3	-146.6
1985	223.0	123.8	-99.2
1986	243.7	157.1	-86.6

Source: BRB and the Ministry of Planning, 1986.

B. Processing and preservation of the main foodstuffs

Like many African countries, Burundi is experiencing a considerable decline in agricultural output, which fell between 1980 and 1983. That has merely accentuated the existing disparity between food production and population growth, a disparity which increased throughout Africa in the decade 1970-1980. It therefore became necessary to step up food aid and commercial imports to offset this reduction in the supply of nutrients. Consequently, Burundi was at pains to produce more food from locally available resources in order to feed an expanding population, maintain rapid urbanization and avoid the food shortages caused by drought.

In that respect, the Government clearly recognized the essential role of the processing industry for foodstuffs and agricultural products, and the inherent limitations of the traditional systems.

We must acknowledge the efforts that have already been made in Burundi to set up certain factories after detailed pre-investment studies and the establishment of a training programme, efforts that also include programmes for the use of local raw materials, at least in part. Other large modern factories have been bought and installed without any detailed pre-investment studies having been made. Since agreements for the transfer of technology do not include any provision for technical training, the receiving country is often incapable of mastering these technologies properly. Consequently, no substitution products have been found for foreign imported foodstuffs (malt, wheat), and a heavy drain on foreign currency reserves has resulted. These factories were often built without regard to the locally available agricultural raw materials, and the Government of Burundi has been obliged, in view of the large investment undertaken, to import raw materials without, however, making provision for their ultimate replacement by local resources.

We shall now turn to consideration of the following processing industries: cereals, beverages, sugar, fruit and vegetables, oil, meat, milk, coffee and tea.

1. Cereals

The branch of the food industry concerned with the processing of cereals is divided into two main parts: industrial processing and what is known as "unofficial" processing, itself subdivided into a craft component (very small) and a domestic component (larger).

We shall be concerned primarily with industrial processing, which is fortunately the sector for which there is the largest amount of information. To the extent that the Government is pinning great hopes on this sector, we have attempted to make an in-depth analysis of the industry, which comprises, for Burundi, a flour mill, two modern breweries, a unit producing sorghum beer, a rice-processing factory, and a craft workshop (MUSALAC) producing a farinaceous baby food. The flour mill and the two breweries work with imported raw materials; wheat imports were as follows during the period 1980-1987:

Table 19

Year	Wheat		Flour*		Total wheat equivalent	
	in tons	mill. FBu	in tons	mill. FBu	in tons	mill. FBu
1980	1,017	53	12,913	585	18,008	637
1981	728	36	10,587	474	14,658	509
1982	2,167	129	8,804	394	13,751	523
1983	6,842	226	7,276	306	16,416	532
1984	7,845	122	16,959	284	30,159	728
1985	14,837	703	3,341	184	19,234	887
1986	6,823	264	3,404	117	11,301	381
1987	7,411	255.7	2,607	89.4	10,841	345.1

*Flour at 76% extraction.

Source: Ministry of Trade and Industry, 1987. The last two columns are deduced from the other four.

The Muramvya flour mill, which has an annual production capacity of 14,000 tons of wheat and 8,500 tons of maize, was built in 1980 with the aim of tapping local production of wheat and maize, which justifies the fact that it is located in a wheat-producing region rather than in Bujumbura. That aim is far from having been realized; in actual fact the mill bought only 22 tons of wheat from the peasants in 1981, 102 tons in 1982, 68 tons in 1983, and as little as 2 tons in 1984.

The mill has a storage capacity of 330 tons of grain and 130 tons of flour. The turnover period is therefore a short one (30 days), allowing for the utilization of nearly 70% of the capacity for wheat. During the period from 1981 to 1987, the maximum amount milled in any year was 8,000 tons, which illustrates the low use of the installed capacity of the wheat mill.

As regards the maize processed by the flour mill, purchases have declined year by year, falling from 1,450 tons in 1982, to 305 tons in 1983 and

254 tons in 1984. These small purchases would appear to have been due to the lack of any real outlets for the flour from the mill. Consumers are not rushing to buy it, because they are used to the flour obtained from roasted maize, which is cheaper.

Brewery use of semolina: We note that the Bujumbura Brewery uses a certain amount of local maize in making the beer customarily brewed with barley malt. This import substitution yielded the country a saving of 150 million FBu in 1982 (or a 40% reduction in imports), but the production of grits by the brewery yields undesirable flour that the flour mill does not know how to dispose of and that clogs the pipes of the brewery. Consequently, it would seem that permission from the Ministry of Trade to use the maize added to wheat to make bread of composite flour should be welcome to the brewery. The amounts involved, 500 tons or more, could be obtained at a lower cost from the brewery. Composite flour could be mixed at the flour mill, where wheat and maize are to be found under the same roof.

The choice of maize as the first substitution product for wheat in this composite flour operation is justified not only by its availability, but also by its relatively low cost by comparison with wheat and its equal value for milling.

It should be remembered, however, that locally-produced maize does not fully cover the needs of the population, which is a situation that partly explains the difficulty in supplying the flour mill with maize. Another limiting fact on the use of maize in brewing is fat content, which apparently ought not to exceed 1.5%. This fat content of maize grains is undoubtedly the main reason why the people use whole-maize flour in their diet.

On the basis of the available statistics, the country's two main breweries produce about one million hectolitres of beer and were hitherto the largest customers of the flour mill for the purchase of semolina. However, the difficulties that the two breweries faced in connection with the high price of this semolina and its irregular supply led them to turn to the use of other substitutes such as sugar and sorghum. It may be noted, for information, that the yields of the various materials are as follows: 75-80% for malt; 65% for sorghum; 75-80% for semolina; 100% for sugar. Sugar is preferred to other substitutes, although currency is used in importing it. Sugar is far less expensive to use than imported or local maize semolina.

As regards the assured supply of materials to the brewery, brewing is an industrial enterprise that has regular activities dictated by the process of fermentation, and no delay is permissible in the supply of the products used. For that reason, orders are placed six months in advance and stocks for three months are held in reserve. The consumption of semolina by the breweries is no more than 5 t/week at the present time whereas the new maize-milling installation at the flour mill has a capacity of 15 t/day, from which we may once again conclude what we already know, namely that the installed capacity of the maize mill could satisfy all the needs of the breweries by working for one month a year, without however taken into account flour brought in during the harvesting period.

For the mill to work at full capacity, an agreement for the regular supply of semolina would have to be concluded between the brewery and the flour mill. Such a contract would have to specify amount, quality, price and

delivery times. It also has to be pointed out that the brewery produces only 40% of its annual capacity during the main period of consumption. Semolina can be stored for at least 12 months at a humidity of 13%.

Wheat and flour imports. Imports, which come in through Kigoma and Dar es Salaam, take a long time. Transport via Mombassa, on the other hand, is faster, but far more expensive. The flour mill therefore prefers Kigoma to Mombassa. The mill has a storage capacity of 2,000 tons at Bujumbura, divided up between maize and wheat, but would like to be able to stock 1,000 tons a month. Containers have been considered for transport, but their high cost has restricted their use.

Experimental production of local wheat. A number of constraints encountered in the promotion of wheat growing are concerned with the restriction on land for wheat, the lack of high-yielding varieties adapted to the country's climatic and ecological conditions, the low-yielding traditional mode of production, pricing policy and the Government's intention to extend the growing of tea in the wheat zone. Despite all these constraints, it appears from a study made by ISABU that the two locally produced varieties (Romany and Cowbird) could take the place of wheat imports if some improvements were to be made.

Experiments with bread made from composite wheat/maize flour. Trial batches of bread made with composite flour in various proportions yielded satisfactory results, as have trials carried out in Senegal for wheat and millet and the Sudan for wheat and sorghum.

The equipment of the flour mill. The mill has two milling lines: one, with a capacity of 47 tons in 24 hours, for wheat and the other, with a capacity of 38 tons in 24 hours, for maize. Extraction is 77% for the wheat mill and around 80% for the maize mill.

There are no major problems over the maintenance of the machinery at the present time provided that the moistening equipment is not used.

Packaging, storage and marketing at the flour mill. Raw materials are stored at the mill in six silos, each with a capacity of 30 tons, making a total capacity of 180 tons. The barn storage capacity at the mill is 500 tons. Given that the buffer stock requirement is 1,000 tons, the enterprise has from time to time to hire silos at Bujumbura, which has six, each with a capacity of 1,000 tons. Grain weevils and/or dampness in the storage depots cause problems in storage and hence give rise to the need to find adequate storage conditions. It should also be noted that there is competition between the flour mill and SRDI to hire silos in Bujumbura.

As regards packaging, the enterprise purchases 50 kg polypropylene sacks by international tender.

With reference to marketing, there is a problem with maize flour, for the reasons already stated.

Personnel and training at the flour mill. No on-the-job training in the operation of the machinery was given to the personnel by the specialist who installed the equipment. The flour mill does have a competent master miller. The other key workers include electricians and economists. It would be

desirable to appoint a milling specialist to strengthen the team and possibly to develop new products. The technicians of the flour mill have had a good general technical education, but would like to improve their training in the more detailed knowledge of special grain-milling machinery and its maintenance. It is recommended that the flour mill should opt either for additional training for some of them in a school of milling, or for the organization of special training courses at the manufacturer of the equipment.

In general, the mission noted low utilization of the installed capacity in the flour-milling industry; difficulties over the supply of raw materials; a lack of outlets for the local roasted maize; a bottleneck arising from the definition of bread as a product derived essentially from wheat; the high price of the maize supplied to the brewery; inadequate production of maize; the fat content of maize of more than 1.5% as a factor limiting its use in the brewery; a lack of credit facilities for imports of wheat and flour for other users; the charging of deposits on containers; restriction of flour delivery quotas to 100 sacks per bakery.

The bakery industry. Along with the beer industry, the wheat trade and wheat industry are the most flourishing industrial sector in Burundi, as they are in other States south of the Sahara. In addition, bread made from wheat is eaten in Africa and imports are increasing from year to year. The total capital invested in the sector in 1986 was 113,000,000 FBu; in relation to the 157 jobs created, this is a level of investment of 712,572 FBu per job created. The first bakeries in Burundi, which date back to 1953, were run by Greek traders, but the oldest still in existence dates only to 1967. There are 20 bakery enterprises in Burundi, most of them belonging to Burundis. The bakery industry uses the greater part of the wheat flour, from which it is able to produce around 100,000,000 units. All public establishments in Bujumbura (schools, boarding schools, the university, military camps, but not hospitals) have their own bakeries which use flour obtained through food aid, which causes some annoyance to private industry. Flour for bread making is obtained through the milling industry (3,400 tons of wheat flour imported in 1986). The average output of the largest town bakeries is estimated at 150-200 tons per year, and the minimum output for a self-employed baker at 5 tons/yr. Cake shops have existed for a long time, but some people are of the opinion that their continued existence may be threatened by factors of various kinds. Most bakeries have modern, imported equipment, which sometimes accounts for more than 80% of the total value of their equipment. Some bakeries have kneading machines, water coolers, dough dividers, ovens and fermentation chambers. Although bread is not regarded as a luxury food, its consumption does fluctuate seasonally and even from month to month.

Energy. The most used energy sources are electricity, wood, peat and fuel oil. Only electricity and fuel oil do not occasion any problems in use, and their prices are fully controlled. Peat, which has many disadvantages, is quite expensive. Some bakeries use wood, which they buy by the stere.

Production. How long it takes to make bread depends on the equipment, the form of energy used and the quality of the flour. Hand kneading is a slower process than electrical kneading. The standard weight of a loaf of bread is 300 g (180 loaves to a sack of flour), but a sample survey showed that most bakeries do not keep to that weight.

Verification. The Ministry of Trade and Industry is empowered to enforce the standard weight. There is no pre-established programme; verification is carried out whenever a trade inspector considers it to be necessary.

Personnel and training. A bakery is usually staffed by the owner, one person in charge, a technician, a bookkeeper and a cashier, qualified bakers, bakers' assistants and sales staff. The bookkeeper takes on the seasonal workers. Very few bakeries have a repair technician to look after their equipment. Should a breakdown occur, the bakeries call in an outside technician who is paid for his services. According to a study on small and medium-sized bakeries entitled The Bakeries of Bujumbura, carried out in 1984 by the University Research Centre for Economic and Social Development (CURDES), 10% of the personnel had not had any schooling, 81% had not gone beyond primary school and 60% had reached the secondary and technical school level (only one of 159 employees in 14 bakeries had reached the university level). The relatively low educational level in the bakeries is explained by the considerable number of workers (bakers, bakers' assistants and sales staff) who are 88% of the personnel. It appears from the same study that bakeries do respect the minimum salaries of the Labour Code, but that the hours of work generally exceed the legal limit.

In general, as regards bakeries, the mission noted that their large number is not justified by the potential market, a consequence of which is under-utilization of the installed capacity; there is a heavy drain on currency for the importing of equipment and technology; modern means of production are creating unemployment (a reduction of the labour force by two fifths); and some related activities, such as confectionery, have a limited life span.

Recommendations on the bakery sector. Given that the flour-milling industry has a monopoly on the marketing of flour, it would be important to initiate a wheat-supply system that would enable it to ensure regular production. Conversely, it would be desirable for the bakeries to improve their storage of flour.

The flour-milling industry should consider the possibility of accepting payment by cheque and, if possible, of extending credit to its customers so as to promote the industry and speed up operations.

Furthermore, the Ministry of Trade and Industry should proceed without delay with the preparation of appropriate food-packaging legislation.

Biscuit making. Biscuits are made by the FABRICHIM enterprise, which also makes sweets. It has a nominal capital of FBu 9,858,902 and the investment cost for the biscuit-making unit is around FBu 12,000,000. Taking all activities together, 25 jobs have been created - 14 permanent and 11 seasonal jobs.

The raw materials are mainly flour, sugar and margarine. All these ingredients are bought locally. Quantities of other ingredients are negligible. The main equipment is a mixer, a rotary cutter, an oven and a packing machine. The equipment was chosen and installed with the assistance of the Industrial Development Centre (CDI).

The output is sold exclusively on the local market and is not competitive on the foreign market on account of the high cost of the raw materials (sugar

and flour) and of the equipment. It should also be noted that there is competition for the locally produced biscuits from biscuits from the preferential trade area (PTA), which are exempt from import duty and pay only the 2.8% statistical duty.

Quality control is carried out by the Belgian Institute for Training and Technology Transfer (IBF) and also by ISABU. The difficulty found at this level is primarily variation in the quality of the margarine used.

Difficulties are also encountered at the packaging level, because it is on a quota system and there are no means of control. For all the above reasons, the rate of utilization of capacity is low, 20 to 30%. In trying to deal with the problems with which it is faced, FABRICHIM could look at solutions such as the use of better raw materials, on the one hand, which could be difficult to do in the short term, because the materials are still produced locally and at high cost, and on the other hand, and above all, the diversification of the product so as to target several markets.

The rice-processing factory. Equipment. The factory has Schule machines with an existing capacity of 2 tons an hour; a planned extension could increase capacity to 5 tons an hour and make it possible to cover the export potential. With regard to the extension, the Schule company will once again supply equipment to a total of about 100 million FBu. The rice-processing factory is satisfied with this choice of equipment. There have not been any breakdowns of the equipment previously supplied in 1976 and the available stock of spare parts will do for the new machinery as well as for the old. The factory will be closed for three months while the extension is carried out with the participation of local technicians.

The products obtained are cargo rice (not yet polished), which is sold to the brewery, and polished rice intended for human consumption.

Packaging. The rice is packed in reclaimed sacks, but it is planned to use woven polypropylene sacks holding 25 kg to satisfy customer demand. Marketing is described in the chapter dealing with rice.

Personnel and training. The company employees qualified technicians and, in particular, an electrical engineer, a motor mechanic and supporting staff. The other departments of marketing, bookkeeping and accounting are run by competent personnel who have also received good training. The local technicians will have the advantage and the opportunity of taking part in the installation of the new 5 t/h production line, which will itself be very important on-the-job training.

Difficulties of various kinds have been encountered: the cost of local raw material, which is not competitive with unhulled rice imported from Tanzania; manufacturing and storage costs; bank charges; the restricted nature of the market; difficulties of exporting to neighbouring countries.

2. The brewing and soft drinks industry

Beer as currently brewed is, by definition, "a drink obtained by the fermentation of an extract of germinated cereals in water, with the addition of hops". However, the legislation of some countries has provided a more restrictive definition of a drink obtained by fermentation without

distillation, the only ingredients for which are germinated barley, yeast and water. We have noted that the broader definition is best suited to Burundi. The raw material, mostly malt, for the manufacture of Primus beer is imported in most of our countries. The value of these imports in 1987 was 674.3 million FBu. It is clearly the expansion in the sales of the brewing industry that conditions the import requirement.

The picture of the export trade in beer and other beverages is as follows: the value of exports of Primus beer corresponds to 1.4% of the value of total exports; exports, which are mainly directed at bordering countries, show a tendency to increase. That partly justifies the planned extension that should raise the capacity of the BRARUDI brewery to 1 million hectolitres, which is a positive factor for the sector. Nevertheless, we should point out that the currency balance of the foreign trade in beer, lemonade and other mineral waters is an adverse one for Burundi. Beer output in 1987 was 800,000 hl of Primus beer and 50,000 hl of Amstel beer. The production of mineral waters (soda, Coca-Cola, Fanta, etc.) and of passion fruit juice was 27,000 hl. These quantities are the output of three establishments, two of which are in Bujumbura. There is a brewery that produces a beer of traditional type based on sorghum; it has a capacity of 900,000 l/yr. We shall take the BRARUDI brewery as our example of the brewing industry and try through it to analyze the problems facing the industry, referring mainly to beer, because it is the essential element in its output.

The BRARUDI brewery. With its output of about 1 million hectolitres, the BRARUDI Company is the sixth or seventh largest brewery in Africa. It uses imported barley malt as a raw material. In terms of the amount of beer brewed, Primus is the leading product of the BRARUDI brewery, followed by Amstel. Only the second of these two beverages is properly labelled and has a strength indication. The standards of the European Brewery Convention (EBC) are applied to the control of manufacture. The operations of cleaning, crushing and grinding are carried out by the same equipment as is used in the flour-milling industry.

Beverages. We include beer, mineral waters and lemonade etc. in this category, some six types of manufactured beverage in all, mainly coming from two factories (some with foreign participation, which is the case for the BRARUDI brewery, where the Dutch Heineken group has 60% of the capital and the Government of Burundi has 40%). Originally, however, this brewery was 100% foreign. The Bragita brewery also produces beer made from imported malt barley. We note, moreover, that storage is in a CO_2 atmosphere in grain silos with a capacity of about 2,000 t. The bottles are produced locally by the Verrundi Glassworks. The need to import raw materials - malt barley and hops - is the main limiting factor on this industry. Attempts have in fact been made to grow barley in two regions - Mugamba and Bututsi - but the results obtained were highly variable. The main constraints reported at this level appear to be the high cost of production and the shortage of land. Those regions that are highly suitable are in fact mainly reserved for stock farming, and the growing of tea and wheat.

3. The sugar and confectionery industry

The sugar industry. The Moso Sugar Company (SOSUMO), which commenced operations in July 1988, is the only sugar refinery in the country. It is a mixed public-law company with a capital of FBu 2,145 million and three main shareholders: the State of Burundi (99%) and the Burundi Brewery and the Burundi Finance Company (= 1%).

The explanation for this heavy capital investment is the weakness of the internal ability to provide finance and the almost total absence of a local capability in sugar technology, which was the root cause of the slowness in carrying out the project.

Promising trials of sugar-cane growing in Burundi in fact date back to 1969, from which time onward the country became increasingly interested in the promotion of sugar cane. Many studies have been made since that time, including the feasibility study of the NETHA Group (1979) and the assessment report of the ADB (1981), both of which have an important bearing on the carrying out of the project.

The Moso Sugar Company was established in 1982, subsequent to the establishment of the National Sugar Office (ONASU) in 1980. Long delays ensued, and it was not until December 1987 that the factory was completed. During that time the cost of the project had risen to almost twice the initial estimate (10,146 billion by comparison with 6.5 at the outset) owing to the devaluation of the local currency and of the dollar against the currency of payment, which created a financial gap.

Refinery capacity and planting programme. The refinery has a capacity of 100 tons a day, or roughly 14,000 t/yr, which could be increased to 23,000 t/yr. This capacity was arrived at on the basis of the local market, which was small and irregular at the time when the study was made, but which is now expanding. A distillery use could be found for the cane by-products, which could contribute to a number of local specialities (passion fruit and mango liqueurs). We give below the figures for sugar imports (in tons) over the last 11 years:

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
4,066	8,317	4,209	6,834	8,329	5,627	10,000	12,306	17,010	19,000	21,000

The initial planting programme was for the growing of cane on an irrigated area of 1,416 ha. When the refinery began operations in 1988 about 650 ha had been planted, and the programme for extension was as follows:

Year	1989	1990	1991	1992
Area under cultivation (ha)	1,416	1,916	2,560	2,560

Owing to the late arrival of site preparation equipment there will not be enough sugar cane during the first three years. If the undertaking is to be profitable in the medium term, it is absolutely essential to increase the area under sugar cane in areas where it was not planned to have irrigation. This additional area may be operated either by SOSUMO itself or by the peasants on individual plots.

Four varieties with satisfactory yields are currently being planted and experiments are in progress on another five. The research is being carried out at ISABU, which is collaborating with other institutions, especially Cuban and Mauritian ones. SOSUMO is already considering extending the refinery and is going to popularize the growing of sugar cane in neighbouring regions (the Rutana and Buragane project) to solve the problem of the shortage of raw materials and to meet the increasing demand.

Operation of the refinery. When the refinery began operations in 1988 some shortcomings became apparent. The company has therefore sent a letter to the supplier of the equipment requesting that the imperfections noted be rectified so that the acceptance certificate can be issued. As some of the equipment was manufactured under sub-contract, there are grounds for assuming that the supplier is first going to consult the sub-contractors whose equipment is not operating satisfactorily. Some of these imperfections have to do with the moisture content of the bagasse at the process level; the reduced total recovery at the process level; and the colouring of the sugar.

Because of the imperfections referred to above, SOSUMO's sugar is unsuitable for the manufacture of some products such as lemonade etc, syrups and some biscuits. Fortunately, that is no great detriment to the company at the present time because that particular market is negligible in the country. The extraction rate, which is 10.43%, as against a planned 10%, is satisfactory.6/ The cane has a sugar content of 13.5%. Despite these imperfections, output has exceeded the forecast: 4,635 t, as against 4,300 t.

Quality control. There are two laboratories, one at the agricultural level and the other at the processing level. The refinery produces raw sugar and white sugar. The analyses carried out are concerned mainly with the colour, moisture content, conductivity, and degree of crystallization of the sugar.

By-products. The by-products of the refinery are molasses, bagasse and sludges. The molasses is at present being sold to stock farmers, but there is a plan to use it in a distillery for alcohol fuel. Were this molasses to be available in sufficient quantity, other projects could also be carried out, such as vinegar making, and a bagasse-producing plant as a source of energy during the manufacturing period (to power a steam turbine) and of sludge, which is spread on the fields as a fertilizer.

Personnel. The refinery has nine engineers, including engineers with training in sugar technology and electricians. Despite their training, they lack experience, and courses are needed to increase their performance. Training is currently given at two levels: on-the-job, where there is a training mission consisting of two technologists and one electrician; and abroad, on Mauritius, in Cuba and at the premises of the supplier of the equipment.

Maintenance. The refinery is still new at the present time and has not yet caused any major problems, despite the imperfections noted. There is, moreover, a two-year guarantee after acceptance and relations with the supplier of the equipment appear to be good. It should also be noted that the refinery has a well-equipped workshop.

There are nevertheless grounds for thinking that some of the equipment is technologically sophisticated, which might lead to recurring charges in case of breakdown.

Packaging and storage. The sugar is packed in 50 kg polypropylene sacks lined with polyethylene, which are purchased on tender. The warehouse must be enlarged.

6/ According to the refinery's technicians.

The design of the refinery. The refinery and even the irrigation channels for the agricultural component have been designed with a view to the production and processing of 230,000 t of sugar cane (forecast for 1992) without additional investment. Given that the potential supply by SOSUMO is estimated at 23,000 t for 1992, it will be seen on looking at the projections that the potential local demand will not be able to be met.

Imports will therefore still be needed until the capacity of the refinery has been increased to 1,500 tons of sugar cane a day, which would raise the annual capacity to 315,000 tons and would need an additional investment of 800 million FBu for the refinery, which has been so designed as to make this extension possible.

Confectionery. Sweets are made by FABRICHIM, which also makes biscuits. Its capacity of 40 t/yr is geared to the small local market. The investment cost has been estimated at about 5 million FBu and six jobs have been created. The raw materials used are basically sugar (purchased locally from SOSUMO), glucose (imported from Kenya), colouring matter and citric acid (both imported). Sugar and glucose are the main constituents, roughly 70% and 30% respectively. Cellophane for immediate wrappings is imported, whereas outer packaging is purchased locally. The basic equipment - marble worktops, moulds, trays and cooling tables - is manufactured on the spot. The equipment was chosen for the promoter by the Belgian Institute for Training and Technology Transfer (IBF). The manufacturing process has the following main operations: the dissolving of the sugar; its heating; the addition of glucose syrup; boiling at 145-148°C; turning out onto the marble table; addition of flavourings, colouring matter and acids; shaping, wrapping and packaging. The main problems encountered by this industry are concerned with the smallness of the domestic market, and with the non-competitiveness of the local product relative to the imported product, which is due to the fact that the locally produced sugar is expensive and the imported glucose is heavily taxed, whereas the similar imported products manufactured in the PTA pay only the statistical duty of 2.8%.

4. The fruit and vegetable industry

A cursory glance round the processing industry of Burundi shows that, except for examples of small ventures at the village level, such as those launched by the "volunteers for progress" (jams), only the FRUITO Company can be identified as a unit carrying out processing of passion fruit on a semi-industrial scale.

The FRUITO Company arose from an extremely modest project for the making of syrups and jams in a kitchen, from which it emerged that there were prospects for the satisfaction of local customers attracted by beverages based on natural fruit juices. There was a potential market in the large towns, more especially Bujumbura, and the passion fruit was the only available raw material affording scope for rapid development.

An in-depth study of the potential for processing the fruit and producing a beverage that would satisfy the demand of the market conditioned the choice of process and equipment suited to the purpose and, above all, the size of the enterprise. With technical assistance from IRFA the project got under way in April 1987 with the installation of processing equipment supplied by the

French SIMACO Company, and with an expert from IRFA supervising the starting up of the production line, personnel training, the finalization of the product and its quality control.

The manufacturing equipment and processes. The semi-industrial scale passion fruit juice production line was finalized by the SIMACO Company through financial assistance from ANVAR; the scale of the units proposed ranges from a few thousand litres to 500,000 litres a year. The equipment supplied to FRUITO was calculated to produce 600 bottles (33 cl) of nectar a day, or about 600,000 litres annually.

Manufacturing process. The manufacturing process comprises several operations, some of which, especially at the stage of reception and preparation of the fruit, are carried out by hand:

* reception: the fruit received in the factory is weighed and then sorted by hand to eliminate damaged, overripe and underripe fruit. The fruit is then cleaned by bubbling in a rotary washer with a capacity of 500 kg/hr. Workers load and unload the washer by hand, an irksome process, but one that prevents the juice from becoming bitter;

* extraction: the resulting pulp is fed into a vertical sieve fitted with an 0.5 mm mesh screen and with a high-speed blender rotating in it. The centrifugal effect passes the pulp through the screen and into a vat in which the pure juice is diluted with water and has sugar added to it (1 kg of passion fruit yields 0.27 of a litre of pure juice, which is diluted in 6 litres of water after the addition of sugar at a rate of 400 g per litre of pure juice). The nectar thus obtained is then pasteurized;

* bottling: the hot nectar is then injected into previously washed and disinfected bottles. After capping, these bottles are inverted in a water bath which corrects any possible mistake in pasteurization;

* packaging: the bottles are labelled by hand before being packed in corrugated cardboard boxes manufactured by CARTOBU.

Generally speaking, particular attention was paid to ensuring that any need for an outside technician should be eliminated in the FRUITO production line. The only maintenance is replacement of a few essential components (exchangers, joints and connectors) and control thermometers.

The supply of fresh produce. With the assistance of a "collector", the promoter of FRUITO currently collects passion fruit in the Bugarama region, some forty kilometres from the factory. Fruit that the collector has assembled along the side of the road from small quantities bought from the peasants is picked up by truck. About a ton of bulk fruit is thus transported to the factory at the end of the collecting trip. The average price of passion fruit is 40 FBu/kg. The current output of 600 bottles of nectar a day requires an annual harvest of 36 tons of fruit. It is currently estimated that the rural community sells about 35 tons of passion fruit a year to Bujumbura; more will be produced now that the customer is guaranteed.

In order to increase the growing of passion fruit the promoter of the project has established more contacts with institutions such as the Department

of Agronomy, the Market Garden project, the Regional Development Companies of Kirimiro and Buyenzi (Kanyanza), the Bututsi project and the project on "High-Altitude Food Crops". Since then the projects have maintained plant nurseries to increase the growing of passion fruit where it is already popular and to introduce it into new regions that have the necessary climatic and ecological conditions.

Some 40,000 plants have already been planted by the Kirimiro SRD and 3,000 by the Bututsi project. The "Project on High-Altitude Food Crops" also distributed 100,000 plants during the 1985 and 1986 seasons. Considering that there are 1,000 plants to the hectare and that the yield in the rural environment is one ton of fruit per hectare per year, the Kirimiro, Bututsi, Bugarama and Muramvya regions could provide 145 tons a year within 12 to 16 months for a period of six years.

Nevertheless, when processed to a concentrate at 45° Brix, this weight of fruit (145 t) would produce around 15 t of concentrated juice, which is far too low a volume to recoup the cost of juice-concentrating equipment.

Furthermore, the promoter exported fresh passion fruit to Brussels during the 1986-87 season and envisages doing the same on other European markets, given that the Belgian market is small and not very rewarding. This activity is making a direct contribution to the promotion of the crop in the rural environment, providing the peasant with a ready sale for his output.

Bottling. FRUITO has bought 33 cl glass bottles from the Bujumbura bottle-making plant. Certain problems here are leading the promoter to make some changes:

* the promoter wishes to change the type of bottling, replacing the 33 cl opaque amber bottle with a 25 cl transparent bottle. The jet filling that is possible with this quantity is cheaper and would make it possible to reduce the unit cost and thus make the product more accessible;

* the Gitega Brewery accepts FRUITO empties, but cannot use Amstel bottles. Because a larger deposit is charged on the Amstel bottle, the depots of the Gitega Brewery receive a regular supply of FRUITO bottles, which obliges the promoter to purchase further supplies regularly from the Bujumbura bottle-making plant and is strengthening his resolve to change the bottling of the product.

Qualifications and supervision of the personnel. The enterprise currently has a staff of 14. Supervision is provided by the promoter, who was trained in "juice technology" when the unit commenced operation. The other staff do not need any special qualifications, as their work consists only of handling operations and the monitoring of some data (temperature and pressure).

Output and monthly sales of the processing unit. The FRUITO Company began to produce passion fruit juice on 15 June 1987 and local sales in Bujumbura began on 1 July. The average monthly output during the first five months of operation was 565 bottles (33 cl) a day, whereas the forecast for the first year of the project had been 450 bottles a day. Moreover, increased supplies and a sustained demand led to the rate of production being stepped up to 1,100 bottles a day both in December 1987 and in January 1988. That has been paralleled by a regular increase in sales on the local market ever since

marketing began. Sales match output, and there is no stock of the finished product. FRUITO is currently putting out 20,000 bottles (33 cl) of passion fruit juice a month. FRUITO sells its output directly to a wholesaler in Bujumbura and to private customers who buy directly from the factory. Groups are supplied by FRUITO, but there is not at present any network of sales outlets. Such a network will be needed when the increasing tempo of production has saturated the spontaneous demand of the existing purchasers.

The only competition facing the fruit nectar on the local market comes from pure juices or fruit syrups produced on a small scale by sell-employed producers without any regular quality or respect for the rules of manufacturing hygiene. Although these "pirate" products are slightly cheaper than the FRUITO nectar, it is the FRUITO product that has a local reputation for quality and manufacturing standard.

Constraints noted in the fruit- and vegetable-processing sector. The constraints noted in the sphere of production have to do with the following points: management of peasant holdings; lack of production sectors; the country's lack of varieties of fruit and vegetables for which there is a demand in foreign markets; the total lack of applied research.

There are the following constraints in the sphere of processing: ignorance regarding raw materials; lack of consistent and selective data on the composition of by-products, their yields and potential uses; lack of a laboratory facility for the technological study of raw materials.

The constraints in the sphere of transport include: the landlocked nature of the country; a disadvantageous position as regards ports of access; the lack of suitable equipment; and the limited freight capacity.

The constraints in the marketing sphere include: the restricted domestic market; the financial size of companies and their lack of know how; taxes and access to credit.

5. The vegetable oil industry

Cottonseed oil. This sector is of interest to Burundi because cotton yields an edible oil that is widely used in bakery and for current consumption. The RAFINA Company purchases 5,000 to 6,000 tons of cotton seed a year, which yield 500 tons of oil. Cotton seed yields a shell and a kernel. The latter yields oil, cattle cake and soap stock. The factory, which is equipped with old machinery, operates at 50% capacity because of a shortage of raw materials. It is capable of handling ground nuts, soya and sunflower, but needs a minimum amount of 1,000 tons.

Description of how cotton seed is treated. The seed is put through a delinter that removes the remaining fibres from the seed; it is then passed through a sheller. The cotton meal obtained is roasted to make the oil easier to extract. The press cake is fed to cattle. The oil undergoes a series or refining operations: mixing with refining additives, decantation, neutralization, bleaching, filtration and deodorizing. The fine oil is stored in tanks for bulk sale. The residue, a kind of sludge, is sold to soap works. The RAFINA Company exports both oil and cake to neighbouring countries, especially Rwanda.

The palm nut oil and palm kernel oil works. This oil works is largely owned by the State, which holds 25% of the shares through the Rumonge Regional Company; the other shares are divided up between the Burundi Finance Company (SBF), the National Economic Development Bank, SAVONOR, INDURUNDI and PALMA SPRL. The oil works cost 170 million FBu in 1986. It processes clusters of palm nuts.

Harvesting and sale of clusters of palm nuts. The harvested clusters are sold to the oil works, which treats them on the same day or on the following morning at the latest in order to avoid acidification of the oil. The price for clusters ranges from 8 to 12 F/kg, depending on supply and demand and on the season.

Treatment - processing to extract the oil. Sterilization. The fresh clusters are placed in perforated tanks holding 1,500 kg and placed in a steam sterilizer. The steam is introduced in three stages: first stage: injection of steam at a pressure of from 0 to 1 bar for 10 minutes, after which the steam is allowed to escape; second stage: injection of steam at a pressure of from 0 to 2 bars for 10 minutes followed by its release; third stage: injection of steam at a pressure of from 0 to 2.5 bars for 30 minutes followed by its release. The sterilization process takes a total of 50 minutes.

Blending. The picked off fruits are blended to facilitate total extraction of the oil during pressing.

Pressing. Pressing yields fibres, press cake and crude oil juice which undergoes several stages of purification: removal of fine waste on a vibrating screen; sludge removal; a type of skimming process to separate the water, the soiled sludge and the oil.

Oil quality. This factory-produced oil is of a higher quality than that produced by craft workshops.

Table 20

Comparison of factory-produced and craft workshop-produced oil

	Factory-produced	Craft workshop
Acidity, mg KOH	5 to 7 mg	14 mg
Moisture content	0.5 to 4%	7%
Impurities	0.00	30.00

The oil produced by craft workshops becomes acidified because of the traditional method of picking off the nuts, which is to let the cut cluster ferment on the ground for five or six days so that the nuts can be picked off without any effort.

Marketing. The oil produced is sold at 250 F/l to large customers, the armed forces, the WFP, schools and cooperatives. SAVONOR buys palm kernel oil at 40-42 FBu/kg. The oil is packed in plastic drums holding 50 to 70 kg. Returnable casks holding 200 litres, bought from SAVONOR at a cost of 2,000 FBu, are heavy and difficult to handle, owing to the lack of lifting

equipment. Neighbouring countries would like to place orders that the oil works is not in a position to honour and they do not come more than twice. The oil needs to be adequately packed to protect it. The oil works faces competition from self-employed craft producers who sell their poor-quality output at a lower price; the craft producer does not take into account the time spent on processing or the 15% tax on the transaction.

Future prospects. The requirements of the oil works, 54,000 tons, will not be satisfied under the planting programme until 1991. It would be desirable to complete studies rapidly and to speed the building of the new works or the extension of the existing works. From 1991 onwards the squandering of production through the overburdening of the works must be avoided and craft workers must not be allowed to produce poor-quality oil unsuitable for consumption or export.

In conclusion. The present works is operating at 16% of its capacity, but will be overloaded by 1991; the output from Rumonge will not be able to satisfy the needs of the Burundi population for vegetable oil; the craft method of extracting oil squanders the harvest because of the lack of oil presses.

The Rumonge project has divided up the plantation into small family holdings, which avoids a lot of the cost of upkeep and lowers the cost price of the oil.

6. The meat and meat products industry

This industry is represented by the public abattoir in Bujumbura and four butchers shops/delicatessens in the private sector (private individuals, foreigners).

The Bujumbura public abattoir. This has been a self-managing public institution since 1983. Its function is the purchase and slaughtering of cattle and the sale of meat. It has a staff of 23 Burundi nationals.

The resources of the enterprise. The enterprise derives its present income from fees paid for its services to users, namely: slaughtering, preservation of meat by cold storage and transportation to the point of sale or consumption. Charges vary: 300 FBu for cattle, 100 FBu for sheep, 100 FBu for goats and 300 FBu for pigs. In 1988, 22,403 cattle, 13,357 sheep, 8,886 goats and 2,857 pigs were slaughtered. The numbers slaughtered increase year by year - from some 13,000 cattle in 1983 to 22,403 in 1988, an increase of 73%.

Supply and slaughtering. The abattoir is supplied by cattle traders. The animals are kept in a nearby cattle yard for 24 hours before slaughtering to rest them and to see if they are ill. The cattle are killed by stun bolt or other less modern methods and whole carcasses or quarters are hang up for post-mortem examination of the meat. Any suspect meat is kept in a deep-freezing room (-14°C) before laboratory analysis. The good meat is kept in the cold room until fully hung ready for eating, or is removed by the owner if he has the necessary facilities for hanging meat.

Installations and hygiene of the premises. Except for cold chains, the abattoir was relatively well equipped at the time when it was built, but the way in which it was run down to 1987 did not yield sufficient income for the

upkeep of this equipment. For the above reasons and by virtue of the fact that the abattoir is some thirty years old, the installations have fallen into a state of disrepair incompatible with its purpose, which is to provide the population with healthy meat and possibly to use by-products.

Although some measures were taken in 1988 to improve hygiene, especially the evacuation of slaughtering waste, much remains to be done, if only to restrict public access to the abattoir. It should be noted, however, that the Fifth Five-Year Plan provides for the building of a multi-purpose abattoir to solve some of these problems. A feasibility study is being made.

Quality control. This task, which is carried out by veterinary technicians, includes visual inspection, verification by cutting and laboratory analysis. Suspect meat is kept in the deep-freezing room until the results are obtained. The various categories of meat have a distinctive mark. The legislation applied is that of the Belgian Code, which is reproduced in the Burundi Code and Law of 1970. The main diseases found are cysticercosis and tuberculosis.

Use of by-products. With the exception of hides, insufficient use is made of by-products. A cattle feed factory has attempted to recover blood. Production trials of biogas generation were undertaken and later abandoned.

Personnel. The abattoir has qualified personnel: two veterinarians, a food-industry engineer and veterinary technicians.

Projects of the abattoir. It is planned to establish a training centre for butchers and pork butchers at the public abattoir in Bujumbura. The aim of this project is to introduce Burundis who want to work in the meat industry to the elementary techniques for the processing and preservation of meat as a food. The entry of Burundi nationals into the trade would lead to the appearance on the market of sausages and cooked meats at prices affordable by people with an average income. There are several motives for this project. There is no method of preserving meat in the rural environment. Meat is eaten on the same day as the animal is slaughtered. Agricultural officers whose task is to instruct the peasants in the areas of agriculture and the care of animals, could include some methods for the processing and preservation of meat in their programme, for example smoking, drying, salting etc. Moreover, cattle are on the decline both in quantity and in quality owing to the progressive reduction of pastures. One of the solutions being envisaged to avoid being confronted with a shortage of animal protein in the years to come is to develop small-scale stock farming, pig breeding for example. It must be noted with regret that there is some reluctance to eat the meat of this animal in some regions, mainly owing to a lack of knowledge of preparation methods. It is an abnormal situation that even in a town such as Bujumbura this kind of meat is to be found only in butchers and pork butchers owned by foreigners. Pig meat is more expensive in the town, although pigs are easier to raise.

The training of Burundis as butchers and pork butchers with a knowledge of the elementary techniques for the preparation of this meat would undoubtedly help to make it more popular: instruction should include the types of cut, categorization of the various parts, presentation, and cookery advice for customers.

Pork butchers. There are four in Bujumbura, all owned by foreigners and selling to customers with a high income. Some, such as the New Butchers/Pork Butchers [Boucherie-Charcuterie Nouvelle], have their own stock farms where they fatten pigs and cattle. The New Butchers/Pork Butchers has created 20 jobs. Butcheries/pork butcheries are essentially a tripartite operation: the marketing section, the machine room for food processing and the cold rooms.

The marketing section consists of a sales room with refrigerated display cabinets in which the products are divided up into four groups: (i) beef: fillet, rump steak, rib steak, sausages, suet etc., (ii) pork: shoulder for roasting, leg for roasting, pork chops etc., (iii) lamb: leg, shoulder, chops etc.; (iv) miscellaneous: poultry, rabbits, ducks, turkeys.

The machine room. Well-equipped pork butchers have deboning tables, mincers, cutters-and-mixers, curing vats, brine vats, smoking boxes etc.

Cold rooms. Some pork butchers have two.

Industries preserving meat and meat products. No such industries exist at the present time, and the vacuum-packed and tinned meat available on the market is imported.

Conclusions and recommendations - meat and meat products. The delicatessen trade is the main processing of meat and meat products. This small-scale activity is always connected with butchers' shops. The butchery element is dominant in the combined enterprise, accounting for at least two-thirds of the total activity.

Almost all the products of the delicatessen trade are mass consumption popular products (sausages, slicing sausages, paté, blood sausage, chitterlings etc.). Some meat-based products are still imported to satisfy what is an alleged local demand. The amount of equipment installed in pork butchers/delicatessens varies considerably. Consumption of delicatessen products has been marking time for some years. The foreign European population has declined considerably at a time when the consumption of the local population has increased only very slightly. Annual per capita consumption is very low.

For the moment it would be preferable to attempt to replace imported meat-based products by, for example, examining the possibility of producing them locally using local raw materials, introducing new techniques and, while so doing, finding vacuum packages for some products.

The preconditions for the creation of a meat-preserving industry in the meat sector are the rationalization of stock farming by its integration into a developed agricultural system and the improvement of trading networks. As regards the delicatessen trade, which is a small-scale activity at the present time, financial facilities should be made available for new activities for the local production of products that are the same as or equivalent to imported products.

7. The milk and dairy products industry

This industry is represented by three enterprises: the Bujumbura Central Dairy, Produlait and the Kiryama Dairy and Cheese Plant. The first two are the most important, the third being known mainly for its cheeses.

The Bujumbura Central Dairy (LCB). This is a semi-public establishment set up in 1974 with the assistance of FAO. It has a capacity of 10,000 litres per day and handles an average of 6,000 litres per day. The milk comes mainly from neighbouring farms (roughly 7,000 litres). The dairy has a staff of 60. In addition to milk, it also produces butter, cream and yoghurt.

Milk supply. The LCB collects milk from the farms with which supply has been arranged and from other producers mainly around the northern trunk road from Bujumbura to Rugombo through authorised collectors. Before picking up the milk, the collectors carry out elementary analyses, testing for smell, acidity, suspended matter etc., after which they record the amount collected provided that the quality is acceptable.

Collection takes place mainly in the morning in standard churns used specifically for the collection and transportation of milk. Detailed analysis is carried out at the dairy. The milk collected is made up with reconstituted milk imported from EEC countries to meet the demand. The milk collected is cooled only on the farm and in the dairy. The continuity of the cold chain is broken during transportation to the dairy. The problems connected with collection are the main reason for the low level of production of the dairy. The dairy is in Bujumbura, which is not an ideal locality for the keeping of dairy cows. That is why milk is collected from farms fifty or so kilometres from Bujumbura, with the result that the costs of collection are high. It may be recalled in passing that Burundi has imported cattle from neighbouring countries to improve the quality of its dairy cows.

Equipment. The dairy was a gift from UNESCO. It has been difficult to identify the supplier for the purpose of obtaining spare parts because the equipment comes from several countries. It has, however, been possible to solve the problems of spare parts and training since LCB succeeded in contacting the supplier of the largest batch of equipment. LCB is currently faced with a problem of an administrative nature: it has to place any order for more than 250,000 FBu through a public tenders board although there is only one supplier for some products or equipment.

Quality control. The Central Dairy has a small microbiological and chemical laboratory mainly for more accurate determination of acidity, fat content and density. As already pointed out, some analyses are made at the time of collection, and others in the Faculty of Agronomy. The standards applied are those of the International Federation.

Bottling and storage. The bottles (low-density polyethylene) are imported from Italy.

Personnel. The Dairy has qualified staff consisting of two engineers specializing in the treatment of milk, a chemist and a laboratory technician.

Projects of the LCB. The enterprise has two projects: the installation of cooling centres to increase the quantity of raw milk collected, especially in the evening; the introduction of a UHT line for pasteurization and sterilization. Milk produced in this way will last longer. This project will be carried out with the assistance of the CDI. The reasoning behind the project is that there are periods during the rainy season when raw milk is plentiful (a time of low consumption) and periods of shortage during the dry season (a time of high consumption).

Produlait. The plant, which commenced operations in 1988, has a production capacity of 4,500 litres per day, but that could be increased since the limiting factor is the pasteurizer, which has a capacity of 900 litres per hour (7,200 litres per day). The bottleneck arises in the packaging plant, which has a capacity of only 1,000 litres per hour for milk in one litre sachets that is reduced to 500 l/hr when packaging in 0.5 litre capacity sachets. The investment cost is about 88.8 million FBu.

Supply. The supply points are Gihanga, Muramuya and Rugoma. Produlait has a daily output of around 3,254 litres, 1,000 litres of which are raw milk, and the rest is reconstituted powdered whole milk to an equivalent of 2,254 litres.

Manufacture. The manufacturing processes are the same as at LCB and amount to the simple operations of standardization, homogenization and packaging.

Equipment. The dairy has highly efficient equipment of medium capacity. Since the machines are new there are fewer problems at this level. The lack of spares for some sensitive parts, such as the shaft of the homogenizer, may give rise to serious difficulties. There are also problems connected with the excessively high temperature in the sealing of the sachets with the packaging machine.

Quality control. Only chemical control is carried out in the dairy; hitherto it has consisted of sedimentation tests, analysis of acidity and fat content, and verification of the filling level of the sachets. Microbiological analyses are conducted at ISABU. Losses of milk have been recorded because of acidity and poor sealing of the sachets. Losses of sachets have also been recorded on occasion and are above the standards in force.

Personnel. Produlait has qualified staff, but they do not yet have much experience. They include a milk specialist, a chemist, a technician, two machine operators and workers for the production section.

Packaging, storage and marketing. As at LCB, the packaging material is imported from Europe. Provided that the packaging is intact, the reconstituted dried milk will keep for five months. The entire output is sold. The main networks extend from the kiosk in town to supermarkets and sellers on bicycles. Prices are the same as those charged by the Central Dairy.

Produlait project. The enterprise intends to increase production and diversify its products. It also intends to set up a farm to raise dairy cattle.

The main constraints facing the milk and dairy products industry are found at the following levels:

Burundi markets for milk products. Given that local milk production is extremely limited, is largely consumed by the producers themselves and is inferior to the imported quality, the import statistics provide a clear overall picture of consumption.

Dairy farming. It is on a very limited scale, is dispersed and is above all on family farms. Industrial milk production currently comes from a few large farms (e.g. 1,000 litres a day on a lowland farm). The Burundi authorities are interested in improving dairying in a traditional setting, in which the envisaged increase in milk production could possibly supply a small dairy, and serve above all to increase the rural demand. There have been several feasibility studies on the creation of industrial dairy farming centres based on imported dairy breeds. SAB plans to raise 50 imported cows. Nevertheless, it is difficult to carry out such projects owing to the risks of such an investment, and it is expensive (health measures, selected cattle, appropriate balanced feeding etc.). The cows' milk produced on the Ruzizi Plain is largely collected and sold by the Bujumbura Central Dairy. The amounts collected are 1,500-4,000 litres a day. Once a solution to the problem of sterilization and aseptic packaging has been found, the amount of milk sold and its life will be appreciably increased.

The reconstituted milk industry. The Bujumbura Central Dairy and Produlait are the dairy industries in the real sense; they manufacture reconstituted liquid milk. The production from dairy farming is supplemented by reconstituted milk based on milk fat or butter oil and milk powder. The product, which has a fat content of 0.3%, is pasteurized and sold in plastic cartons. Total production averages 150,000 litres a month. The Central Dairy has two sales networks: department stores, the hospital, the armed forces and the schools take roughly 50% of the output; the other roughly 50% is sold from door to door by roundsmen on bicycles. The price ex-works is 45 FBu/litre; the resale price is 100 FBu/litre.

Milk-distribution customers

The traditional African market. As explained above, the distribution of fresh milk is limited and suffers from adverse climatic conditions. Door-to-door sales of the type practised by the Central Dairy imply rapid disposal within 24 hours at the longest, especially because the milk is merely pasteurized. For this reason the products sold in African markets are limited to sweetened and unsweetened condensed milk in tins of from 170 to 400 g; powdered milk in small and large containers; milk products in containers are weakly represented in the African markets and in the interior of the country.

Trade of European type. Shops are found side by side with the traditional market in Bujumbura and the large towns. There are several department stores that obtain supplies of milk products from importing companies and their customers are mainly Europeans and well-off and middle class Burundis.

Storage and means of transport. The distribution of fresh milk products is impossible at the present time owing to the long distances involved, the lack of cold rooms and the lack of refrigeration vehicles. All developments in the sphere of the industrial production of milk products should concentrate on the production of "long life" packaged products that can be kept for several months even when not refrigerated.

Prices for milk products in Burundi. A number of factors must be taken into consideration when seeking to arrive at an idea of the price of milk and its impact on the amount consumed. These factors are: the price of milk, which is not always related to a quantity because distribution is in

accordance with the preference of each user; the quality of the product (effect of humidity on milk powder); its origin; whether it is whole milk or skimmed milk; whether it is sweetened.

Recommendations on the dairying sector

We have pointed out that the development of the milk industry in Burundi is proceeding on a very limited scale and that imported milk products are sold at high prices. The increasing popular demand for milk products will necessitate greater imports but will be beyond the reach of the majority of the population whose financial resources are limited. A number of recommendations may be made at the following levels: (i) Collection. Collection should be made easier by the repair of access roads to the collection areas; the milk should be filtered and its density measured on collection; attention should be paid to the cleanliness of the containers used by the producers and they should be replaced by aluminium containers; attention should be paid in dairy plants to cleaning, and to the sterilization of churns and premises. (ii) Dairies. Attention should be paid to preventive and corrective maintenance of the equipment and machinery and to the availability of an emergency repair team; a reasonable stock of spare parts should be held; premises, utensils and packaging should be kept clean and tidy. (iii) Personnel. The health status of the personnel of the dairy should be monitored by regular medical examinations; further training should be given to the personnel through the awarding of training grants to attend establishments specializing in the treatment of milk.

8. The coffee industry

(i) Development of the industrial activity of OCIBU. The national output of arabica coffee has increased by about 700 tons a year since 1960, while output of robusta has remained stationary between 1,500 and 1,900 tons. Total output, which was around 12,000 tons at the beginning of the 1960s is now around 30,000 tons. The average annual increase over this period has been 3.5%, but was higher (5.4%) during the first few years and a little weaker (2.8%) since 1980. This output is subject to great fluctuation on account of climatic conditions and the cyclic nature of coffee growing: 42,000 tons in 1981-1982, the lowest recorded harvests of the last 12 years were 17,100 tons and 18,500 tons. In addition to running the factories, OCIBU has since 1978 distributed farming supplies (insecticides, minor equipment items) needed by coffee planters and maintained the hand-operated pulpers installed in the villages. It also carries out the functions of research, popularization and training. Since 1978-1979 it has also had to operate as a "wholesaler", financing the parchment coffee collecting campaign (making cash advances to private collectors). This network leads to the production of arabica.

(ii) Manufacturing. The country's entire coffee production is processed in OCIBU's two modern plants: one at Bujumbura, the other at Gitega. They were built to the same pattern and they share the production equitably. The processing comprises the following stages: reception and processing proper. In the case of coffee we shall confine ourselves subsequently to an account of the main difficulties encountered at the storage level. Packaging problems are dealt with in the chapter on packaging.

There is a small industry based at OCIBU Bujumbura that satisfies the local demand for roasted and ground coffee. The coffee beans are roasted and sold at OCIBU.

(iii) Main constraints noted as regards:

(a) Bulk storage of coffee

Parchment coffee stored on the ground for months takes up moisture, especially in the layer in contact with the cement. Continuous measurements of moisture content must be made to assess the extent of this phenomenon. In order to avoid such contact, we suggest that the ground should be covered with plastic film and that a half-metre thick bed of sacks filled with parchment coffee should be laid on it before proceeding to bulk storage.

The new coffee plants have given rise to a below par rating for Burundi coffee estimated at 5-6 centimes per pound; this shortfall arises from the reabsorption of moisture during storage; the impact huller used may cause beans pierced by insects to split. Electron microscopy could detect the operation involved.

An analysis of a batch of coffee some time after hulling shows that the beans that tend to lose colour do not exhibit the characteristics of good hulling: the median line should be present, and should be regular and straight. The bleached grains have been pierced by an insect and that has allowed moisture to get in.

(b) Packaging

This matter is dealt with in Section C of this chapter - Types of support for food processing.

9. The tea industry

The tea produced in Burundi is broken-leaf tea consisting of very small particles, fannings and dust. Almost all of it is earmarked for export, mainly to the London and Mombassa markets. Burundi teas are highly thought of at the London tea auctions for the consistency of the product and the brightness of the liquid. The first-line grades obtain the highest prices on that market. Seconds, which it is uneconomical to send owing to the high freight costs, are sold on the Mombassa market. Because Burundi is landlocked, it has to produce very high-quality tea, and as much as possible of the more remunerative first-line grades. The country's manufacturing capacity is 6,000 tons spread over four factories: Teza, Rwagura, Tora and Ijenda.

(i) The importance of leaf quality

Consequently it is impossible to make high-quality tea from a coarse picking consisting mainly of tip + 3 shoots. Selective picking is also necessary to obtain the highest proportion of first-line grades. The greatest care is needed in handling the harvested crop. Above all, the leaves must not be compressed in the course of picking, in the picking baskets or during transportation to the factory. The effect of leaves being crushed is to initiate an uncontrolled fermentation process which is revealed by the heating of the leaves, and which adversely affects the optimum manufacturing conditions.

(ii) Manufacturing process

The tea produced in Burundi is manufactured by the rotorvane - CTC 7/, rotorvane - LTP 8/ and LTP processes. The sequence of operations is as follows:

Leaf reception. On arrival at the factory the leaves are weighed on a platform balance before being discharged in a reception area. They are then loaded into triangular canvas containers suspended on a monorail on which they are carried to the withering room. When the leaves are brought to the factory in wide-mesh sacks they are directly attached to the monorail. A sample of leaves is taken on reception to check the composition of the harvest.

Withering. The purpose of withering is to impart plasticity to the leaves by making them lose some of their water through evaporation. The operation is conducted in withering troughs, which may be as much as 30 m long, 2.25 m wide and 20 cm deep. Each trough incorporates an air duct with a reversible fan and a heater at one end. The bottom of the trough has a perforated trellis on which the tea leaves are evenly spread out in a layer filling the trough.

The equipment of the troughs is capable of passing 500 m^3 of heated or unheated air a minute up through the trough or of sucking the surrounding air through the layer. In the manufacturing processes employed the leaves are withered to a moisture content of 70%. The operation takes 12 to 18 hours.

The withered leaves are reloaded into the containers or sacks and sent along the monorail to the shredding and fermentation room, where they are first fed on to a sieve that removes undesirable foreign bodies (earth, debris from the picking basket and dried leaves, and pieces of metal).

Shredding. The purpose of shredding is to tear and twist the leaves so as to break down the cell walls and jointly expose the polyphenols and polyphenoloxidase to the air.

The withered leaves are first chopped in a rotorvane, a hollow toothed cylinder 15 cm in diameter inside which there is a rotating wormscrew extended by vanes. There is a regulator at the far end of the cylinder to adjust the pressure exerted on the leaves as they pass between the teeth and the vanes.

Leaf shredding is continued in a CTC or an LTP. The CTC machine has a calender-type action. It consists of two cylinders with engraved metal sleeves that provided a surface consisting of a multitude of tiny knives. These cylinders rotate at different rates, 70 rpm and 7,000 rpm. Three CTC machines are placed in tandem at the end of one rotorvane.

The CTC crushes, tears into small particles and curls the shredded leaves coming from the rotorvane. In the LTP machine the leaves are reduced to fine particles by hammers and knives. This machine has the merits of being

---

7/ CTC: Crushing, tearing and curling.

8/ LTP: Lawrie Tea Processor.

compact, and easy to maintain and to use. In addition, it increases the proportion of first-line grades. A rotorvane-LTP manufacturing line was recently brought into operation in the Teza factory parallel to the rotorvane-CTC process; all shredding of withered leaves at Rwegura is carried out in an LTP machine. Treatment of the leaves takes only a few minutes in these machines. The shredded tea is known as dhool.

Fermentation. Fermentation begins with the shredding of the leaves in the rotorvane and is completed in an installation that enables it to take place under specific conditions of temperature and pressure. The equipment consists either of a fermenter or of fermentation troughs. In the fermenter the dhool is spread out on a large mobile perforated plate through which air flows. A humidifier located above the mobile plate safeguards against the tea drying out during fermentation. The other system consists of a battery of troughs on castors that can be connected to a moist air duct. The dhool is set to ferment in these troughs in a layer 20 cm thick. There is a thermometer in each trough for temperature monitoring.

The fermentation temperature must be kept as low as possible (23 to 28°C) so as to develop the properties of the infusion (sharpness, bright colour and strength) to the full. The time taken for fermentation varies with the ambient temperature in the factories, but the process is usually completed within about one and a half hours.

Drying. The aim of drying is to halt the enzymatic and chemical reactions taking place during fermentation at the moment desired and to adjust the moisture content of the tea to 3% for its preservation. Half the weight of water in dhool must be evaporated to that end. The desired result is achieved by exposing the tea to a forced current of very warm air.

The vane-type drier has been abandoned in favour of a fluid bed dryer to get round the disadvantages: frequent breakdowns; a burnt taste; low yield.

Grading. After drying, the cooled tea is sorted into several classes, known as grades, by particle size. Most of the fibres present in the tea are removed at this time. These operations are carried out by grading machines, vibrators equipped with a set of screens, and by fibre extractors, which are a series of plastic-coated cylinders that, when revolved, separate the tea from the fibre by the difference of electrostatic charge.

A pre-grader in the grading chain initially separates the dried tea into two categories: first-line and second-line tea. These categories are then separately graded to yield the first-line grades PF1 (Pekoe Fannings one), PF (Pekoe Fannings), PD (Pekoe Dust), and BP1 (Broken Pekoe one); and the second-line grades BP (Broken Pekoe), F (Fannings) and BMF (Broken Mixed Fannings). The only significance of these names in the classification of broken teas is to designate particles of different sizes. Several fibre extractors are inserted in the grading chain to improve the final presentation of the grades. Second-line grades are sometimes put through the grinder again to increase the proportion of fine grades, but this operation often gives the tea a greyish tinge. Only fine picking is capable of yielding a high percentage of first-line grades.

The dry tea, which is extremely hygroscopic, picks up some moisture in the course of grading and reaches the 5-6% level at which preservation is assured.

The various grades are then stored in silos to await packaging. In a factory producing high-quality tea the distribution of the various grades is as follows:

first line: PF1 (26%), PF (7%) and PD (32%) and BP (17%) = 83%
second line: BP (2%), FNGS (11%), FNGS (-) D (2%), BMF (2%) = 17%

Packaging. Because the daily output of the same grade is not necessarily identical, the contents of the silos must be homogenized in large containers before the tea is packed.

The use of three-ply tea chests lined with aluminium foil has become too costly. Hermetically sealed polyethylene sacks lined with a second sack of woven plastic are now used. Depending on the grade, the net weight of these sacks is 45, 50, 55 or 60 kg. Even more recently 5-ply kraft paper sacks lined inside with aluminium foil have been used.

Quality control. The tea maker has to monitor the tea made daily, checking on the moisture level and appearance of the tea manufactured, and the characteristics of the infused leaves and the liquid. Manufacturing defects are detected in this way.

Maintenance of hygienic conditions in the factory. Because tea is a food product it must be handled with the greatest care at all stages in manufacture; it is also possible for it to become soiled very rapidly. In particular, care should be taken not to scatter the leaves on the floor of the reception area and when filling and unloading the withering troughs. The machinery in the shredding and fermentation room must be washed with water every day to avoid all bacterial contamination. Dust from the grading operation must be removed. Scrupulous bodily hygiene will be required of the workers, who will have washing facilities at the factory and will be provided with working clothes.

Personnel. The personnel of the factories visited receive on-the-job training; there are between 80 and 120 employees in two teams.

Maintenance. The equipment in all the factories is in working order; preventive maintenance is carried out every Monday.

Unfortunately the tea companies are facing serious manpower problems. There are plantations and private plots of land around the industrial units, and their owners prefer to work them rather than go to the units.

The solutions envisaged for the time being are the building of a housing estate for workers from outside the area and the provision of lorry transport to take workers back to their home communes for the weekend. A 600 ha plantation needs a labour force of some 1,200 people.

C. Types of support for food processing

We shall consider under this heading all the activities that accompany and support the food industry. These include: packaging; laws and regulations; the information system; finance; financial backing and taxation; and the supply of water and electricity.

1. Situation and prospects of the packaging industry

"Nowadays no product can be sold, or transported, or distributed without some form of packaging. It is thus acknowledged that packaging is a dynamic element in the economic development of the entire country". In order to discuss the situation, we must look at the need for the sector itself. In Burundi, where 95% of the population lives on activities connected with agriculture, packaging and presentation techniques are still "primitive"; only a very small proportion of the population (20 to 30%) enjoy the advantages of rational packaging and presentation. As in many other countries, abundance and shortages often coexist. The resources of one region or subregion do not find their way onto the consumer markets of other regions or subregions, and hence there is a situation of serious shortage. This situation is due essentially to the use of inadequate means of transport and inadequate packaging and presentation that may entail losses of as much as 80 to 90% of products, sometimes in multiple forms. Many of our countries still have not become aware of the importance of rational packaging and presentation, although that awareness is the first step towards the improvement of modern methods of processing and manufacture, in which integrated systems of packaging, presentation and marketing are the precondition for any judicious distribution of products.

The traditional packaging and packing materials such as sacks made of vegetable fibres (jute, sisal etc.) and heavy wooden crates are used primarily for bulk products. Baskets made of bamboo or similar materials padded with rice straw or wood shavings or other similar products are in general use in many developing countries for fresh products such as fruit and vegetables and fish.

It is not uncommon in Burundi to see very light and cheap packaging being used for products that are fragile or said to be susceptible to temperature, gases, light, damp and various biological agents. Although this packaging may formerly have been suitable for the transportation of products over short distances and for storage for short periods, it is not suited any more to the existing conditions. Consequently, it is not unusual to find that a high proportion of the goods transported are damaged or broken before reaching the consumer because of the poor quality of the packaging. These are only a few examples to stress the need to adopt suitable techniques essential to the country's economic growth.

The packaging industry in Burundi is characterized by three types of packaging; that manufactured locally; that used for exported products, which is known as export packaging; and what is called import packaging.

Locally produced packaging

Corrugated cardboard boxes. It is at the level of use that this sector has its most important place; the shape of cardboard boxes is essentially related to the end product and suitable cardboard, and lastly, strictly speaking, to the packages. Cardboard is rarely used in the raw state, but is worked up by CARTOBU into small boxes and especially into large boxes (of locally produced corrugated cardboard, and of imported solid cardboard). Most of the output is used locally (soap, fruit juice, Primus beer). Some 10,000 boxes were used for exports in 1987.

Glass bottles. The entire production consists of hollow glassware, which is used mainly for liquids. The theoretical capacity (in 250 ml beer bottles) of the very modern glassworks in Bujumbura (VERRUNDI) is 30 to 35 million bottles a year, which could be increased to 40 million with a 15% reduction in the weight of the hollow body. At the present time most of the output is used locally, but exports to bordering countries are on the increase, and VERRUNDI exports a fair proportion of its output.

Polyethylene sacks. The country imports a lot of (granulated) raw materials, including types of polyethylene, polyvinyl chloride, polyester and polystyrene. The main uses are in the manufacture of polyethylene sacks and sachets. There are two low-density polyethylene film-blowing plants in Bujumbura producing various thicknesses of polyethylene film in sufficient amounts to satisfy the fairly limited local demand.

Jute sacks. There used to be a sack-making company, but it closed because it was not working at full capacity.

Packaging for agricultural and fishery products

(a) Export products. The following constitute 90% of exports:

Coffee: the coffee crop accounts for roughly 87% of total exports, an amount of 30,000 to 40,000 tons, for which some 520,000 to 600,000 jute sacks imported by OCIBU from Bangladesh are needed.

Tea: this is also a sector of some importance, with a total of 3.600 to 4,000 tons packed in 5-ply kraft paper sacks with an inner lining of aluminium foil - roughly 50,000 to 80,000 sacks, that are also imported.

Cotton: the share of exports is declining and supplies to the COTEBU textile plant are increasing. Nevertheless, this activity represents 470,000 bales, for which jute covers are needed.

Fruit: FRUITO, a young enterprise set up in 1986, exports 1.5-2 tons of passion fruit a week in corrugated cardboard boxes. This company carries out its own grading and packing and makes fruit juice from the quantity that is not exported (fruit that is overripe, spotted, or too small to satisfy western standards).

(b) Products intended mainly for the local market:

Jam: all production is for the local market (strawberry, pineapple and red currant jam). It is planned to start diversification with tomato concentrate. Glass jars produced by VERRUNDI with imported caps are used for packing.

Fish: the smoking of lake fish is a small-scale activity because there is no preserving plant, and were there to be one it would certainly face the obstacle of the lack of a box-making plant.

Sugar: the 50 kg polypropylene sacks lined with polypropylene that are used to hold sugar are bought by tender.

Import packaging

This group includes packaging that has been used for imported and exported goods such as wooden packaging; cardboard packaging; metal drums; sacks (kraft, polyethylene, polyethylene-polypropylene, jute and cotton); and transport auxiliaries such as wooden pallets, containers and seals.

Very little import packaging is used in the food industry.

Packaging problems

(a) Dispatch of coffee

As mentioned above, coffee is traditionally packed in jute sacks imported from Bangladesh. The sack weighs about 1 kg. Two solutions may be considered to make savings on the price of the sacks and on transport costs: the use of ventilated containers that will probably be quite expensive; the use of woven polypropylene sacks that should effect a freight saving of about 450 tons a year, but for which several tens of trial dispatches would first be needed.

(b) Bottles

Bottles are dispatched in containers and breakages occur because of the jolting and braking that are inevitable in the course of transport. Better securing is possible, either by the use of inflatable air cushions at the ends of the container or with particle boards. these two types of securing are reusable provided that the accessories are returned with the container.

(c) Situation regarding fruit juices

The only possible means of dispatch is by air owing to the excessive delays of sea transport, and the logistic constraints that would result for the product. There is, however, the snag that a 310 g container must be used for 250 ml of passion fruit nectar, which entails an air freight charge of 12.9 FBu per bottle, or roughly the sale price of the product contained in it.

Several solutions have been proposed to FRUITO: concentration of the juice and its redilution in Europe or the USA; the exporting of larger quantities (200 litres for example) in returnable or non-returnable casks for packaging into units in the country of destination; the adoption of new packaging:

* Metal containers: this packaging, which must be corrosion-resistant, and therefore of high quality, is probably more expensive than glass; moreover, where fruit juices are concerned, a move is to be noted away from metal containers towards glass in the industrialized countries;

* Boxed bottle: this type of packaging, which ensures excellent preservation of the product and attractive polychrome presentation, is probably not feasible for quantities of less than one litre;

* DOYPACK (R): this system uses a self-supporting sachet of a composite material. The advantage of lightness is offset by the difficulty of opening and its manufacturing cost is a little higher;

* Two-way polyester bottle: this type of bottle is light, gas-proof and smell-proof, odourless and transparent. On the other hand, its use calls for the introduction of equipment that does not at present exist in Burundi. In addition, the raw material is fairly expensive, but that may be largely offset by the weight saving and the reduction of breakages.

(d) Fruit and vegetables

Opinions differ as to the quality of cardboard packaging: some airlines find it inadequate, but box makers are satisfied.

2. Laws and regulations

There is legislation dealing with some aspects of the agro-industrial sector to be found in "Code and Laws of Burundi" [Code et Lois du Burundi] published in 1970. Most of the provisions that it contains were inherited from the home country and were drawn up in its favour. This legislation is used only in part, having regard to its obsolescence and other defects. For example, the manufacture of and the trade in foodstuffs are governed by a decree of 10 June 1929, and the observance of this provision was monitored by the Government of the colony at that epoch. The legislation contained in the "Code and Laws of Burundi" deals with most foodstuffs, both local and imported: coffee, bananas, beverages, fish, mineral waters, lemonade etc., flour and bread, meat, rice, milk and dairy products, oils and fats, eggs, and jam. However, as mentioned above, this legislation is not up-to-date and is not in operation because it is mainly concerned with prohibitions and leaves on one side the other parameters concerned with the quality of food products. This latter defect is ascribable to the lack of a national office of standards.

Despite the lack of up-to-date legislation, three ministries appear to be especially active at the present time in the regulation of foodstuffs:

(i) The Ministry of Trade and Industry. The Department of Domestic Trade intervenes in trade, include the food trade, through its inspectors. Should a product be obviously rotting, or if it is suspect, these inspectors take appropriate measures, and in particular send samples to laboratories within the country that are competent to carry out certain types of analysis.

(ii) The Ministry of Health. This ministry intervenes at two levels:

* it has a hygiene department that monitors hygiene in bars, restaurants and hotels;

* there is also a department for food toxicology.

(iii) The Ministry of Agriculture and Stock Farming. In the main it intervenes in the monitoring of meat and the conditions of slaughtering through veterinarians and technicians.

The Ministry of Trade and Industry is currently launching a National Office of Standards and Quality Control for the purposes of export promotion and consumer protection. The establishment of this Office will also make it possible to update the legislation. Some of the projected activities will be: (a) the drafting and adoption of standards for raw agricultural products and

for processed products in as far as agriculture is concerned; (b) the inspection of locally manufactured and imported products to ensure that they conform to the standards; (c) the issuing of certificates of quality for locally manufactured products; (d) sanctions against offenders to discourage the manufacture and marketing of poor-quality products.

It is to be suggested that the Ministry of Trade and Industry should work closely with the institutions that are involved at the technical level and that these institutions should share the duties, should the need arise. For example, the Ministry of Health would concern itself with food safety.

Standards would be drafted in consultation with the competent representatives of the food industry and of the institutions that take part in the technical work connected with the preparation of foodstuffs (Faculty of Agronomy, ISABU, etc.). This group would also draft regulations on the packaging and labelling of products. Labels on packages should provide sufficiently clear information on: (a) the name of the product; (b) the composition of the product; (c) batch number, date of manufacture and the date by which it should be consumed; (d) net weight or volume etc.; (e) the manufacturer's name etc.

Priority over standardization should be given to the food industry so as to protect the consumers, on the one hand, and to maintain and promote exports, on the other. Almost all export receipts are derived from this sector. The standards section should have on its staff specialists in chemistry, biochemistry, microbiology, packaging techniques and storage.

The quality control department should have personnel who are fully informed on the techniques and requirements of the food industry. It should also be in a position to carry out such analyses as moisture content, and composition - sugar, carbohydrates, protein, fat, crude fibre, and acids.

Lastly, the legal and administrative section should be the coordinator and should be responsible for the prosecution of those who contravene the national standards.

Having regard to the high cost of laboratory equipment, the Office of Standards should first make an inventory of the laboratory capacity in the country and acquaint itself with the collaboration procedures before buying its own equipment.

Three laboratories appear to be particularly indicated at the present time: the laboratories of ISABU, the Faculty of Agronomy and FOREAMI.

3. Information systems

The planning of industrial development and of technological policy at the national level should be backed by objective data. As regards the food industry, the essential information, such as that concerning production (average yield among the peasants and in research stations, numbers of cattle and poultry) must be as up-to-date as possible. Data on the availability of fish must also be up-to-date so that measures may be taken as and when necessary.

Information concerning agriculture and stock farming in Burundi is available at the Ministry of Agriculture and Stock Farming and at ISABU, while

information on fishing is available at the Ministry of National and Regional Development, Tourism and the Environment. Data on industry may be obtained from the Ministry of Trade and the Ministry of Planning through the National Research and Statistics Department (SNES). Despite the large number of institutions able to supply information, it is very difficult to obtain up-to-date information owing to the lack of or fragmentary nature of the data.

Now that the first Ministry of Planning has been created, information is certainly more centralized, but it is too early to see what effect that will have. SNES is the body responsible for the collection and publication of statistics on all aspects of the country's life. Unfortunately, it is not always able to give all the information required on some sectors because it still does not have sufficient resources in manpower and equipment.

The Ministry of Trade and Industry is responsible for coordinating industrial development, but it has not yet set up a system for the regular collection of data on industrial enterprises. In order to overcome this deficiency, it is proving to be essential to establish administrative machinery to oblige industries to submit periodic reports to the ministry. The latter could publish a bulletin on trade and industrial development with information of use to industry, especially on government policies. Such a bulletin could also give relevant information on technological changes and in related areas.

4. Financial questions

The National Economic Development Bank (BNDE) is a development bank that finances agricultural and industrial projects with lines of credit from ADB, KfW, the Central Office for Economic Cooperation, AGCD, and the World Bank (Apex Fund). The Bank has deplored the lack of technical information for promoters and for itself before financing a project. It collaborates with the Centre for Industrial Development (CDI) in setting up projects and providing technical assistance with management and equipment purchases.

Promoters would like to see the establishment of a data bank in the Ministry of Trade and Industry that would serve as a source of information on new technology and its costs. It has been noted that a promoter quite often submits pro forma invoices for the supply of machinery from the first broker contacted, and has no point of reference for assessing the value and competitiveness of the tender submitted.

The Bank is experiencing a lack of project promoters; it has unused lines of credit totalling more than one billion FBu.

(i) Financial support - incentives

A financial infrastructure has been inaugurated to promote the development of local industries. Financial institutions such as the National Economic Development Bank (BNDE) and the Burundi Finance Company (SBF) have been created.

Despite the existence of a relatively satisfactory financial infrastructure, the system of financing is still not very favourable to industrial development. Credit interest rates remain high and the National Guarantee Fund has not yet begun to play an active role.

The credits allocated to agriculture are still very low because bankers hesitate to give firm support to this sector, subject as it is to climatic uncertainties, and this is reflected in the modest development of agriculture. Furthermore, the venture capital system has not yet been introduced.

The main beneficiaries of financial backing are above all the public enterprises engaged in growing coffee, tea and cotton, which receive subventions at the agricultural inputs level (fertilizer, pesticides).

The private sector has just been granted a line of credit in the context of a loan from the World Bank: the "Apex credit" for the promotion of small and medium-sized enterprises. The credit is granted through the financial institutions, but with the approval of the Chamber of Commerce, Industry, Agriculture and Crafts (CCI).

At the present time 140 requests have been submitted, roughly a half of which are in the agro-industrial sector. It is to be seen that these agro-industrial projects are mainly (roughly 50%) bakery-confectionary projects, and projects for rice hullers.

It is still too early to assess the impact of this credit on industrial development in general, and agro-industrial development in particular. Nevertheless, having regard to the lack of political priorities, it does not seem a good thing to make economic profitability almost the only criterion. It must, however, be pointed out that this criterion prevails for the first phase of credit and that other criteria could be adopted for the second phase.

(ii) Taxation policy

Until quite recently the National Investment Commission (CNI) granted Customs concessions (exemption from import duties) to those enterprises deemed to have priority status, which tended to favour a capitalist industry. Today the trend is more towards granting tax concessions in the first years so as to encourage industries to look to their management and to maximize profits during this period. It is to be noted, however, that these concessions are granted at the time when the enterprises are making the least profit (the first two or three years). It would therefore be desirable either to move the period of tax exemption, or to extend it.

(iii) Other incentives

The other incentives, which are recorded in the Investment Code, consist of general guarantees and special concessions. The special concessions are proportional to the social and economic importance of the project. These concessions, agreed for the enterprise, are total or partial exemption from taxes for a period not exceeding eight years; total or partial exemption from import duties on equipment and raw materials for a period not exceeding five years; provision is made for other concessions for decentralized enterprises; exporting enterprises may avail themselves of other concessions set out in Decree-Law No. 1/012 of 15 April 1988.

5. Electricity and water supply

(i) Electricity and fuel supply 9/

The country's own biomass fuels - wood, charcoal, farming residues and peat meet about 90% of the final power requirement of Burundi, while commercial fuels cover 10%. Even if the later are a small percentage, the energy bill was 1,083 million FBu for diesel oil and 379 million FBu for heating oil in 1986, or respectively US $ 9.4 million and US $ 3.3 million (1 $ = 115 FBu at 1986 prices).

The average growth of timber is low, population pressure is increasing, and firewood is in short supply. This shortage is leading to a decline in stocks of wood and their replacement by farming residues, which is adversely affecting soil fertility and crop yields. To alleviate this danger, the Government undertook an afforestation programme over an average area of 6,000 ha a year during the period 1978-85.

Another fuel, peat, the reserves of which are 57 million tons, is largely to be found in isolated regions and is costly and environmentally difficult to exploit. Production, which is confined to upland peat bogs, amounted to 15,000 tons in 1986. Consumption is around 12,000 tons. At its current cost of 8 FBu/kg (2.2 FBu/kWh) peat is competitive with heating oil (5 FBu/kg [2.2 FBu/kWh]) but not with firewood (1 FBu/kWh) for industrial heating. However, it produces so much ash that it cannot be burnt in fixed-bed boilers. The introduction of fluid- bed boilers is not profitable in relation to the use of heating oil. Petroleum products represent 67% of commercial power, electricity 29% and peat 4%.

With regard to electricity, the 28.2 MW hydroelectric power station on the Ruzizi was the main source of Burundi's electricity down to 1982. Since that time, national hydroelectric stations have been commissioned. Dependence on imported electricity, which was 98% in 1981, had fallen to 46% in 1985.

The commissioning of the Burundi/Rwanda/Zaire community dam "Ruzizi II" could provide Burundi with excess electric capacity. It would be important for this excess current to be utilized. To that end, a French company, SERETE, has examined the feasibility of replacing some fuel boilers by electric boilers.

The economically exploitable potential is estimated at 300 MW, whereas the power currently being exploited or in course of being harnessed is 32 MW.

Extension of the existing networks and their interconnection will be pursued during the Fifth Five-Year Plan in order to make the networks profitable and to ensure greater safety in the supply to the centres and, above all, progressively to eliminate the use of generating sets, which is the case for the Rumonge Centre and will shortly be so for the Moso Sugar Company.

With the aim of increasing the national share in power generation, those hydroelectric power stations that are deemed to be economically viable will be

---

9/ Source: Fifth Five-Year Plan; World Bank Report No. 6754-BU of 20 January 1988.

converted, interconnection will be continued and power generators will be progressively replaced. Although there may be an excess of installed power and effective production, industry suffers from power failures and above all from variations of current strength that oblige enterprises to have power generators. Although this is a question that affects industrial activity in general, it is particularly relevant for the food industry because of the losses that it may occasion. Leaving this problem to one side, great efforts are made to have a good service.

Gitega, the country's second city, is the main centre experiencing a shortage of hydroelectric power. The other energy resources, namely renewable energy, appear to be limited. Research should concentrate on solar energy and biomass, with special reference to water heating for industrial purposes.

Statistics of electricity consumption in 1987: Total electricity consumption was 93,143,579 kWh, of which 83,209,579 kWh or roughly 90% was consumed by Bujumbura. Consumption by industry and craftsmen is 36,692,225 kWh, which is 40% of the total. Of that figure, 14% is low-voltage consumption and 86% is medium-voltage consumption.

Electricity consumption for industry and crafts has evolved as follows:

Table 21

Year	1984	1985	1986	1987
Consumption (kWh)	22,884,083	31,127,152	26,653,889	36,392,225

Source: REGIDESO.

Note: The increase in consumption over five years has been 37%.

(ii) Water supply

The aim of the Government is to ensure a supply of drinking water adequate in both quantity and quality to meet the needs of the population in the year 2000.

In order to achieve this aim, it is planned to increase the number of piped-water supply systems and to overhaul the existing systems. As Burundi has an abundant supply of water, the techniques adopted often give preference to underground water, the exploitation of which is, in general, more flexible and less of a financial burden than the exploitation of surface water, which has to be treated. The use of surface water would not be envisaged until all underground resources have been exhausted. Water supply is practically a monopoly of REGIDESO. The Fifth Five-Year Plan makes provision for phase II, which is drawing to a close and will permit a production of 78,000 m^3 per day, which corresponds to the 1990 demand. The second stage of the Bujumbura water supply project is targeted for the year 2010, when it is aimed to have a production of 118,000 m^3 per day. Provision has also been made for the Gitega phase II drinking water supply. Current production is 2,300 m^3 per day, not counting the BRAGITA water. The production capacity of the sources

currently harnessed can no longer satisfy the drinking water requirements of this town. The aim of this project is to achieve a total production of 3,533 m^3 per day in 1990.

The drinking water supply of Rumonge, Muyinga and Kirundo is another important project. The town of Bujumbura, which houses 90% of the country's enterprises, does not have any great water problem as regards quantity, the more so because the industrial area is situated at a fairly low level relative to the lake, which is the main source of water. The microbiological standards are acceptable, but the chemistry of the water may make treatment necessary for some operations.

Other centres such as Kirundo, Muyinga and Ngozi do not have an adequate water supply.

Some statistics on water consumption. Total water consumption in the 20 main centres of the country in 1987 was 12,580,000 m^3, of which 10,571,483 m^3, or 84%, was the consumption of Bujumbura.

The share of industries and crafts in water consumption is 1,733,983 m^3, or 14%.

D. Training, research and development in the agro-industrial sector

There are several agricultural and rural training establishments. Starting in the primary school, the rural education offices distribute seeds to the schools. The schools have school gardens that produce and sell foodstuffs, the aim of each school being to start a producer cooperative that can gradually become independent and self-managing. At primary school level, what is known as the community school is thus integrated into the rural environment and dependent on it. Parallel to the primary school, comprehensive schools that have technical equipment, workshops and agricultural implements are being set up in each commune.

1. Instruction

Lastly, there is agricultural instruction, in which context we may mention:

For agricultural advisers and instructors: agricultural schools and training centres;

For technicians and development workers: the Gitega Agricultural Technical Institute (ITAG, established in 1968) which trains technicians at level A2; the Cooperative Training Centre (CFC, established in 1979) under the supervision of the Ministry of Rural Development; this centre provides training for members of the staff of cooperatives, who are able to give general assistance in the field to the cooperators, after one year of training, and become real cooperative development technicians after two years.

At the higher level: The Faculty of Agronomy provides a three-year specialist course for agricultural engineers after two years basic scientific training; the Faculty of Economics and Administration was set up to meet the specific needs of rural development. Managerial staff are trained in this agronomic section so as to be able to help the agricultural population and to

provide them with the means of access to dynamic productive infrastructures. Mention should be made of the courses of INADES and those of the Gitega Social Services School, which provide training for social workers for rural development.

As regards agricultural training, Burundi therefore has quite a worthwhile basic infrastructure, but no technical school or faculty offering instruction on the preservation and processing of agricultural products. No discerning agronomist is providing training on food legislation and hygiene, quality control, packaging and biotechnology in this most vital sector of technology as described in the annex that sets out the country's needs.

2. Research

The same deficiency is to be noted at the level of food industry research. ISABU is the only research establishment that has been active in agronomic research for several years past and has set up its own Food Technology department.

The few research projects to be carried out under the Fifth Plan (1989-1993) are concerned with the following matters:

In the short term: research on finished food products: (a) preservation of agricultural products; (b) processing; and (c) control;

research on finished saleable products: (a) feasibility studies on agricultural processing and production; and (b) studies of processed foodstuffs;

research on data systems concerning foodstuffs in the fresh and processed states;

a contribution to the establishment of a tool for food standardization and legislation;

In the long term: research on products with export potential;

research on the development of agricultural and food by-product uses;

research on industrial crops: (a) quality control; (b) pollution control; and (c) development of by-product uses.

To its credit, the department has carried out research since 1982 on: the milling and bakery properties of the cereals produced in Burundi (wheat and triticale) and on flour mixtures (wheat and triticale and wheat and maize); the protein enrichment of manioc; the other programmes to be developed on the cultivation of sweet potatoes and potatoes; soya; flour from germinated cereals; rice (with the collaboration of the UNDP-FAO Animal Traction Project) and the steaming of rice; control of the acceptability of the properties of taste, smell and appearance and of nutritive value in programmes for the selection of pulses, roots and tubers; and improvement of the manufacturing process for the brewing of sorghum beer.

The department in ISABU has a very small staff, seven professional workers, three of whom are scientific officers (one Burundi and two expatriates) and four of whom are laboratory technicians. The department is quite well equipped for the type of work carried out at present. It collaborates with the microbiological department in the Faculty of Agronomy and with the nutritional department and the hygiene department of the Ministry of Health for some of these programmes.

Mention should also be made of recent interesting applied research carried out by the Department of Food Industry Technology in the Faculty of Agronomy (Bujumbura).

E. Policies and programmes with a bearing on the technological development of the food industry

1. Policies

The policy of Burundi in the various sectors of the economy is set out in the Five Year Plan for Economic and Social Development. The main aim in the agricultural sector is to ensure the self-sufficiency of the population as regards food and to increase the production of export crops. To that end, the institutions concerned will have to disseminate methods and technologies suited to increasing the production of food and cash crops.

In the sphere of stock farming, the aim is to increase animal production so as to reduce the shortage of fats and protein in the diet of the population. The strategy to be envisaged may be to integrate stock farming (cattle and small animals and birds) with agriculture.

As regards fishing, attention will be paid to the organization of fishing in Lake Tanganyika, the creation of a national fish-farming centre, improvements in the drying of fish, hydrological study of Lake Tanganyika, and the strengthening of communal and individual fish rearing.

Measures are planned to organize the supply of the factors of production, to provide essential services (research, training and popularizing and advisory services), to build up and strengthen the existing rural infrastructure, especially as regards roads and credit cooperatives, and to set up global programmes to increase production and to promote individual crops.

A project for the production of phosphate fertilizers is under consideration, as is the production of lime as a conditioner for acid soils. A fruit growing and exporting programme is envisaged for the diversification of exports. Although several measures may be taken, the lack of inputs and population pressure are reducing the likelihood that large amounts of materials will be produced to improve supplies to the food industry.

In the food industry sector, there has been continuation and strengthening of the processing of cash crops, as well as of the policy of import substitution and the establishment of small and medium-sized industries using local raw materials; consequently, the food industry has been encouraged.

The Fifth Five-Year Plan also aims at industrial decentralization, an aim in which the food industry is called upon to play a large role. The creation

of new enterprises at the present time is a matter for the private sector; the State is intervening only where there is a lack of private initiative, especially in projects that are slow to come to fruition. In this context, an entire infrastructure has been set up to help private individuals and entities to create enterprises.

This applies in particular to the National Guarantee Fund, Apex Credit, and the National Economic Development Bank, and the restructuring of the Chamber of Commerce and Industry. Concessions are granted to projects that satisfy the socio-economic development criteria laid down by the Government.

Foreigners engaged in trade are being invited to invest in industry. The Investment Code contains some extremely favourable provisions for foreigners wishing to invest in Burundi, in particular the repatriation of a proportion of the profit in foreign currency.

2. Programmes

There are several programmes for the food industry, in particular:

(i) The project for the establishment of a Centre for Food Technology and Agricultural Mechanization, the aim of which is the priority development of foodstuffs in accordance with the importance of the crops and popular demand. It aims to reduce post-harvesting losses, but also to create small and medium-sized food industries by supporting the promoters when a product being developed is successful. This project will carry out sub-sectoral research on tubers, oil plants, pulses, cereals, and fruit and vegetables. Another part of the Centre's research is to be the development of small pieces of equipment for the processing of foodstuffs and for agriculture.

(ii) The food technology unit at ISABU, which already has a laboratory and has undertaken manufacturing research on protein-enriched manioc and the bread-making properties of various types of flour. It now intends to work to the needs of the market and has already invited industrialists to make their needs known.

(iii) The project for the setting up of a National Standards Office. This Office will provide an institutional framework and will initially make use of the various laboratories that exist in the country. The priorities of the Office are products with an export potential and foodstuffs, with a view to consumer protection.

It should be noted that the three projects referred to above are still in their very early stages; the standardization project is not yet operational.

3. Ways of identifying and promoting projects to do with the processing of agricultural products

(i) Studies of product use and agro-industrial potential

The Department of Industry has undertaken studies of product use through the Food Industry Department in order to identify projects concerned. Three product-use studies have already been made: for manioc, bananas and stock farming.

A further three product-use studies are planned: for soya, fruit and vegetables, and cereals. As far as the study on fruits and vegetables is concerned, inspiration will be drawn from the study of the European-African-Caribbean-Pacific Liaison Committee (COLEACP), which suggests the processing of pineapples to produce juice, jam and beverages, of passion fruit to produce juice and various beverages, of mangoes to produce nectars and stewed fruit, of papayas to produce beverages and fruit in syrup, and of avocados to produce oil and cattle feed.

Study of the food industry potential should be complementary to the study of product use in the food industry branch and should lead to better planning of agricultural resources.

(ii) Industries for which provision is made in the Fifth Five-Year Plan

The Fifth Five-Year Plan makes provision for the extension or modernization of a number of existing units: BRARUDI, FRUITO, coffee factory, rice processing plant, oil mill, cotton ginning factory, and the establishment of new tea and tobacoo factories. The other projects are as follows:

1. Industrial fishing
2. Distillery at Moso Sugar
3. Soya milk
4. Production of gari from manioc
5. Production of starch from manioc
6. Pineapple juice
7. Soluble coffee
8. Cooked meats unit
9. Palm-kernel oil mill
10. New abattoir
11. Kiryama cheese factory
12. Infant foods
13. Avocado oil mill
14. Groundnut oil mill at Moso
15. Potable spirits
16. Vinegar manufacture
17. Bakeries
18. Cigar manufacture
19. Manufacture of baker's yeast
20. Confectionery
21. Tomato concentrates
22. Milk processing and bottling
23. Pasta

Most of the above are extension projects or import-substitution projects. If one analyzes the table on foodstuff imports, it may be noted that the projects for which provision is made in the Fifth Five-Year Plan are essential aimed at their substitution. That is the case, in particular, for the extension to the sugar refinery, the rice processing plant, and the carrying out of new projects - the processing of manioc for starch, the Kiryama cheese factory, the distillery, infant foods, the groundnut oil mill, tomato concentrates, pasta, baker's yeast, vinegar making, confectionery, and dairy products. It may be noted from the same table that it costs the country some 2.4 billion FBu to import food industry products, and that four products (malt, wheat, maslin and dairy products) account for the lion's share, costing around 1.3 FBu, and it seems impossible to conceive of their complete substitution in the medium term and in the long term. Nevertheless, a special effort must be made for a partial reduction in imports of these products.

The Five-Year Plan is a sliding programme. Other projects in which the food industry is predominant have emerged in the context of Apex Credit, in particular bakeries and confectioners, and rice processing plants.

Chapter V

Summary of conclusions and recommendations

A. General observations and recommendations

To begin with, there are a few general observations arising from the above report concerning the agro-industrial sector and technology transfer in Burundi. The situation analyzed by the mission may be summarized at the following three levels:

(1) The importance of the agricultural sector, which provides 90% of the work of the population and yields 50% of the GNP, must be stressed at the level of production and, more comprehensively, of the economy and society in Burundi. Its general features are agricultural production, often based on rudimentary techniques, an inadequate storage system, rather undeveloped methods of preservation, a trading network in need of better organization, transport problems, supply difficulties over inputs, and limited outlets for agricultural products, which partly explains the preponderance of a subsistence economy.

(2) At the processing level, Burundi's industries rely heavily on imported technology, but the capacity to use this technology is often inadequate, or poorly adapted to the specific needs of production, and to the resources of manpower and finance.

(3) At the level of technological policies and institutions, we ought to emphasize the lack of a real integrated policy regarding the acquisition and use of technology in general in Burundi, and the sectoral level in particular. Such a technological policy would have regard to manpower development at the national level, necessarily covering aspects ranging from the use of imported technology to the effort to adapt that technology.

On the basis of these observations, it would be appropriate to mention that, in an epoch in which technology has become more than just a factor determining competitiveness in international trade, and is at the basis of development, it would be to the interest of Burundi to regard technology as an important variable in the framing and carrying out of its agro-industrial policy. Given, for example, the importance of urban demand for food products and the number of economic agents involved in satisfying that demand, it would be advantageous for this policy to take into consideration the whole of the agro-industrial system, within which agriculture remains a major component. The main aim of an integrated policy based equally on the specific needs of the processing industries and on the existing resources would be to create conditions favourable to the adaptation and mastery of technological transfer. That would involve improvement of the existing legal and institutional machinery, and in particular R and D activities, strengthening the development of manpower resources, including skills in the negotiation of technology, and the establishment of legislative and practical policy trends for the acquisition of imported technology and to promote national technology capability.

B. Observations and recommendations by branches of industry

Some recommendations on branches of industry have been made in the course of the report, especially in chapter II, on the main characteristics of food production, in chapter III, on trade in, storage and preservation of foodstuffs, and in chapter IV, on technology and the food industry in Burundi. What follows will be firstly a recapitulation of the main conclusions concerning the chapters mentioned, followed by some recommendations concerning branches of industry or addressed to individual recipients, on the understanding that the body of the document will be consulted for more detailed information on specific aspects of the recommendations made on some particular products.

The country already has a relatively satisfactory basic infrastructure for its industrialization: the country's main centres have a supply of water and electricity and are linked by surfaced roads and by a telephone network. Nevertheless, Burundi's landlocked situation and the difficulties of incoming transport increase the price of the factors of production and often result in interruptions in essential supplies, which obliges enterprises to hold considerable stocks of intermediates and of spare parts. The same transport problem is often one cause of the non-competitiveness of exported Burundi agricultural products. Other problems continue to exist: the predominance of inefficient traditional methods at the agricultural level; the fact, at the marketing level, that trade is still not adequately developed whether as regards storage, packaging or trade information; and at the processing level the shortage of qualified personnel and the absence of establishments providing training for specialists in food technology and the shortage of laboratory equipment. The restricted market in Burundi limits investment opportunities; the equipment used in the sector is generally imported and often not suited to the needs of the country because it was designed for larger markets. Another problem, one that restricts export opportunities and even, on occasion, sales on local markets, is the lack of raw materials at a competitive price. At the financial level, industry in general still has only weak credit facilities. The setting up of the Guarantee Fund should make it easier to obtain agricultural credit and credit for small and medium-sized enterprises.

The industrial sector is very small: the country has only a few large industrial enterprises centred on the town of Bujumbura. In 1986, the country had some sixty or so industrial establishments, 20 of which were, to be precise, in the sector of food industries and beverages. The total workforce engaged in industries processing agricultural products is low for all manufacturing industries. The food industries are facing a number of obstacles to their development: the substantial excess capacity of the existing industries; a restricted domestic market; transport that is costly and very time-consuming for products for export. The domestic market for foodstuffs is very limited, in particular because per capita income is very low. Malt, wheat, maslin and dairy products are the main imported foodstuffs. The other products are sugar and vegetable oils. Exports are dominated by coffee, which accounted on its own for nearly 90% of the total value of the country's exports in 1987. The other products are tea, cotton, beverages and hollow glassware.

There are some 6,000,000 head of livestock of all kinds in Burundi; by converting that figure to a carcass weight of 21,560 tons, we arrive at an

annual availability of meat of 4.3 kg per inhabitant, which is comparatively low by comparison with other African countries. Details on the meat and meat products industry are given in section B.6 of chapter IV. It will have to be emphasized, for example, that the rationalization of stock farming and the improvement of marketing networks are preconditions for the creation of a preserving industry in the meat sector. As regards pork butchery, which is currently a small-scale craft activity, it would be necessary to provide facilities for the financing of new activities for products identical or equivalent to imported products to be available locally.

The country has three dairies, of which two are in Bujumbura and the third in Kiryama. The combined production capacity of the two largest in Bujumbura is approaching 17,500 litres of milk a day, but the actual output is only 9,200 litres/day, because of procurement difficulties relating both to quantity and quality.

As regards fishing, the country potentially has good lake fishing. Fish resources at the present time are estimated at 21,000 tons (maximum balanced production). Nevertheless, according to the available statistics, national production has declined heavily from 10,500 tons to 5,400 tons/yr. Priority consideration should perhaps be given to the preparation of a study on the causes of the fall off in the fish catch and to an examination of how to improve preservation methods and how to develop adequate methods of fish processing that would avoid considerable losses of products (see also sections A.3 and A.4 of chapter II, where there are some recommendations on fishing and fish products).

The country has a flour mill with a manufacturing capacity of 14,000 tons of wheat and 8,500 tons of maize. The fact that it is located not in Bujumbura, but in a wheat-growing region is justified by its purpose, which is to tap local production of wheat and maize. It has a storage capacity of 330 tons of grain and 130 tons of flour. The flour mill is operating at less than its true capacity. It has rarely reached 8,000 tons for wheat, and as regards maize there are serious difficulties over regularity of supply and quality. We would recall that the flour mill is viable provided that wheat production is supported and encouraged. As regards maize, we would also note that, in addition to its consumption by those who produce it, there is quite a large potential market in the breweries.

As has already been indicated, the other possible use of cereals is in brewing to replace malt in the making of the local beer, Primus, by the BRARUDI and BRAGITA breweries. BRARUDI, the largest brewery, has an output of roughly a million hectolitres. Attempts to grow barley have been made in two regions of the country, but the results obtained varied greatly. The main constraints noted were the high cost of production and the lack of land.

Among the roots and tubers, manioc is a part of the diet of Burundis and is currently being developed for the production of gari. There is at present very little processing on an industrial scale of the bananas produced (two varieties - desert and cooking bananas). As regards manioc, there is still a problem with storage, and we are of the opinion that the research being carried out at ISABU will find a solution to the problem of its preservation. Under the heading oil seeds and oil plants we include cotton and the oil palm, which are industrially exploited; palm nuts, the fruit of the oil palm, are processed by a plant at Rumonge. However, the problem at that level is still

in the supply of raw material, both as regards quality and quantity. Marketing is the other important problem that has to be confronted. Like almost all industrial companies, the plant is operating at below its capacity. Some officials consider that the potential for small-scale extraction of oil by craft enterprises could be improved were presses to be made available to them.

The other two related sectors of cereal processing are biscuit making and bakery. The bakeries are medium-sized enterprises that use the greater part of the flour produced. In view of the connection with the flour mill, they suffer from the same problems over flour supply. There is only one biscuit factory; it employs some twenty people. Biscuit making is faced by competition from products from the Preferential Trade Area (PTA) that are exempt from import duty, and pay only the 2.8% statistical duty.

The country has a rice-processing factory for the processing of unhulled rice. The factory, which was planned to handle 9,000 tons, is confronted by a production of 17,000 tons; this appears to be the only case where capacity has had to be increased, to 5 t/hr so as to satisfy the demand.

There is only one refinery producing sugar in the country at the present time. Given that it has a capacity of 100 t/day for 10 billion FBu its cost is among the highest. The refinery has still not reached 10,000 tons/yr. According the technicians at the refinery, the extraction rate of 10.43% is a good average, seeing that the sugar content of the cane is 13.5%. The country has to import to meet the local demand for sugar, which has risen in recent years. Extension of the plantations is planned in response to this demand.

The combined output of tea from the three factories reached 4,000 tons in 1987. The main factors making for a considerable increase in the yield of small family tea plantations are a good price for the leaves, the popularization of better growing techniques among the peasants, and the use of nitrogenous fertilizers. The main problem of the tea factories, after the problem of spare parts, is the labour force. Tea, like coffee, has the benefit of export trading networks. Tea will have an important role to play because it is another sector with export potential for the country.

Coffee, as is common knowledge, provides 85% of the country's receipts, and is, by virtue of that fact, a strategic product for Burundi. But, as the output figures demonstrate, it is subject to appreciable fluctuations. The unknown factors of production, like those of world prices, make this monoculture a cause of imbalance in the country's forecast receipts. In 1988, the country produced about 30,000 tons of coffee. As in the case of tea, the whole of the coffee output is managed by OCIBU.

As regards fruit and vegetables, reference should be made to section A.1 and section C of chapter III, and especially to section B.4 of chapter IV, where matters relating to these products are discussed. In particular, the report deals with the case of the FRUITO Company, which has a capacity of 600 bottles of passion fruit nectar a day (33 cl bottles), or roughly 600,000 litres a year, but effectively produces 80 l/day, employs 14 people and is in operation for about two hours a day. It is faced with problems of raw material supply and competition from small-scale craft producers, and problems in the disposal of its finished products.

Packaging as an industry is focused on the production of corrugated cardboard boxes by CARTOBU, most of which are earmarked for fruit juices and products such as soap and beer. There are two workshops that import granulated polyethylene, polyvinyl chloride, polypropylene and polyester to make into sacks and sachets. Nevertheless, the packaging sector does not produce sufficient to meet the demand and is, consequently, an obstacle to the country's economic development.

Regarding legislation, it is planned to set up a Burundi Standardization Centre.

With respect to research and development, the FAO Project, which has only been in existence for three years, and the Department of Food Technology at ISABU deal with questions concerning food technology. It is hoped that a new centre dealing with the question will be established with the planned new phase for the FAO Project. All the spheres of research and development, training and the dissemination of information for which Burundi needs capacity and capability will be found annexed.

Some recommendations concerning branches of industry or addressed to individual recipients will be found below.

1. Recommendations for improvements in the trade in inputs and crops

(i) Inputs: Fertilizers. Consideration should be given to a fertilizer committee to coordinate the activities of the Government with those of the private sector in the sale of fertilizers; representatives of the various departments and ministries concerned and of the private sector would serve on the committee, which would meet on a fixed date to prepare and discuss solutions to trading problems. Agricultural implements. It would be important to find a solution to the need for agricultural implements through the local production of implements and through the importing of more efficient tools. The collaboration of the Advisory Service of the Ministry of Agriculture and Stock Farming would have to be sought to identify these new tools and to publicize them before entrusting their marketing to the private sector. Seeds. It would be equally important to draft a sowing plan clearly defining the aims, a strategy and the amount of material and manpower resources to be applied.

(ii) Food crops: Whereas it is economic policy to avoid intervening in price fixing and in the marketing of food crops, the Government will be able to improve the incentives to increase production for sale by providing farmers with more efficient new farming methods and techniques in, for example, the following cases: Wheat: It would be appropriate to examine prices and incentives at each stage in the production/importation and processing cycle, and to assess their effect on national cereals production and on marketing. It is appropriate to clarify the institutional provisions made to define the policy of the food survey and to monitor its application. Rice: There are grounds for a closer analysis of the conditions of the rice market, taking account of the most important factors, especially imports from Tanzania, the stock position and the production of substitution products before setting a price for unhulled rice other than the price resulting from the supply of the product and the demand for it.

(iii)Export crops: Measures for a fairer apportioning of the fluctuations in world coffee prices among the various agents should be progressively applied in the medium term. The exporting of coffee is too important for this product to be subjected to all the hazards of carriage by rail without any precautions. It is worth undertaking a study of the conditions for the allocation of a fleet of special goods wagons to transport coffee on the Tanzanian rail network, which would be financed and supervised by Burundi (possibly in association with neighbouring countries), and also the management of the port warehouse set aside for the Burundi output. The attention of the Government has been drawn to this important matter.

(iv) Cooperatives: A management consultancy system should be set up to assist primary-producers' cooperatives and factories. Use could also be made of brief back-up missions for training and refresher training at the provincial staffing level and the effect of this training could be assessed and periodically monitored in relation to operation, management, economic results and participation. These missions will have to attempt to attract participation from the private sector in their commercial operations, especially in rice production, the processing of coffee and the production of palm oil.

(v) Private traders: It would be important to try to assist private traders in the following areas: Information. The collection, analysis and dissemination of data on and prices of agricultural products. Training. On commercial accounting. Working capital. Extension of credit facilities to the marketing of products apart from coffee. Transport. The setting of the vehicle tax on commercial vehicles after a study of the average profitability of these vehicles. Storage. The putting in hand of an enquiry on the conditions of storage all along the line from the producers to the retailers, taking in the various middlemen. The production of recommendations on the investment required, having regard to the possibilities of the various agents involved in trading. Taxation. The putting in hand of a study on the effect of the taxation system on activities in the marketing of foodstuffs and the recommendation of exchanges of agricultural products between the various regions of the country. Credit. It is recommended that specialists be trained in the formulation of investment projects tailored to the real economic needs of the agents involved in trading so as to increase their productivity and their performance.

2. Recommendations for the bakery industry

Given that the flour mill has the monopoly on the marketing of flour, it will have to set up a wheat-supply system that will enable it to ensure regular production. The flour mill should accept payment by cheque, and should if possible extend credit to its customers in order to promote the branch and the speed of operations. The bakeries should consider the installation of good stores to hold stocks of flour. The Ministry of Trade and Industry should also contemplate the rapid establishment of adequate food legislation for packaging and foodstuffs.

3. Recommendations for the dairy industry

These recommendations will be concerned only with the chain itself, i.e. after assembly by the dairy farmer at the following levels. Collection. The collection network must be made easier by the repair of access roads to the

assembly areas; the milk must be filtered and its density measured after collection; attention must be paid to the cleanliness of the containers used by the producers and arrangements must be made for their replacement by aluminium containers; attention should be paid in dairy plants to cleaning and to the sterilization of churns and premises. In the dairies. Attention should be paid to preventive and corrective maintenance of the equipment and machinery ; to the availability of an emergency repair team; to the keeping of a reasonable stock of spare parts; to the cleanliness and tidiness of premises, utensils and packaging. Personnel. Among the important measures to be considered would be the need to monitor the health status of the personnel of the dairy by regular medical examinations; and the need to give further training to the personnel through the awarding of training grants to attend establishments specializing in the treatment of milk. Sale and distribution. It would be important to monitor the sales market and consumer opinion, to provide sales points with adequate storage facilities; and to institute a price control system.

4. Recommendations to exporters

(i) In the logistics sphere. A faster mode of transport with sufficient goods wagons and the right to manage the depot transport should be sought for exportation of coffee.

(ii) In the packaging sphere. For fruit juices and jams adequate, economical glass containers should be sought; a move towards plastic containers may be seen as a serious option. Better quality corrugated cardboard boxes with a bleached kraft paper exterior and a waxed interior should be used to transport fruit and vegetables; woven polypropylene sacks should be used experimentally, with the agreement of an importer, to transport coffee. A securing system using inflatable cushions or particle board should be used in order to reduce breakages in containers in the export of bottles and hollow glassware within the subregion; care should be taken to see that this securing material is returned, possibly by charging a deposit on it.

5. Recommendations on packaging to manufacturers and to the Government

(i) In the sphere of corrugated cardboard. It would be important to make corrugated cardboard with bleached kraft paper on the outside so that products may be better presented on international markets; there should also be cooperation with the Burundi Coffee Company in the experimental use of woven polypropylene sacks for the exporting of coffee.

(ii) Points in packaging for the consideration of the Burundi administration. The Government could (a) treat packaging as a suitable means of ensuring the exporting of products and could re-examine policies on packaging. Each package is specific to the product to be packed, and each corresponds to different tastes or requirements of the customers in the importing country; (b) some of the technicians of exporting enterprises and manufacturers of packaging could be enabled, in so far as is possible, to go abroad on training courses to, for example, Morocco or in western countries (France, Switzerland, Belgium); (c) provision could be made in technical school courses and in introductory or further training seminars for units on packaging techniques, trademarks, labelling and logistics; assistance could be sought from one or more industrialized countries as well as from international organizations likely to collaborate in the programming and carrying out of these seminars;

(d) national bodies carefully equipped to serve as a reference point for all concerned with packaging and presentation in all its aspects could be set up; (e) skills in packaging and presentation could, in general, be improved through educational, training and information services; (f) a technical assistance mission lasting one month could be envisaged in the corrugated cardboard sector with a view to improving the production of cardboard boxes for fruit and vegetable exports; a more far-reaching mission of enquiry lasting, for example, two months could be envisaged for the entire export sector so as to establish in greater detail the packaging requirements of each existing or potential exporting enterprise, to draw up a list of the Burundi enterprises capable of undertaking the production of new packaging, to list the transfers of technology that would be needed, and lastly to draw up a timetable; (g) cooperation over packaging and presentation could be sought at the regional and world levels.

6. Standardization and quality control

The Ministry of Trade and Industry is currently launching a National Office of Standards and Quality Control for purposes of export promotion and consumer protection. The establishment of this Office will also make it possible to update the legislation. Some of the projected activities will be: (a) the drafting and adoption of standards for raw agricultural products and for processed products in as far as agriculture is concerned; (b) the inspection of locally manufactured and imported products to ensure that they conform to the standards; (c) the issuing of certificates of quality for locally manufactured products; (d) sanctions against offenders to discourage the manufacture and marketing of poor-quality products.

It is to be suggested that the Ministry of Trade and Industry should work closely with the institutions that are involved at the technical level and that these institutions should share the duties, should the need arise. For example, the Ministry of Health would be concerned with food safety.

Standards would be drafted in consultation with the competent representatives of the food industry and of the institutions that take part in the technical work connected with the preparation of foodstuffs (Faculty of Agronomy, ISABU, for example). This group would also draft regulations on the packaging and labelling of products. Labels on packages should provide sufficiently clear information on: the name of the product; the composition of the product; batch number, date of manufacture and the date by which it should be consumed; net weight or volume etc.; manufacturer's name etc.

Priority regarding standardization should be given to the food industry so as to protect the consumers, on the one hand, and to maintain and promote exports, on the other. Almost all export receipts come from this sector. The standards sections should have specialists in chemistry, biochemistry, microbiology, packaging techniques and storage. The quality control department should have personnel who are fully informed on the techniques and requirements of the food industry. It should also be in a position to carry out such analyses as moisture content and composition - sugar, carbohydrates, protein, fat, crude fibre, and acids etc.

Lastly, the legal and administrative section should be the coordinator and should be responsible for the prosecution of those who contravene the national standards. Having regard to the high cost of laboratory equipment,

the Office of Standards should first make an inventory of the laboratory capacity in the country and acquaint itself with the collaboration procedures (the conditions) before buying its own equipment. Three laboratories appear to be particularly indicated at the present time: the laboratories of ISABU, the Faculty of Agronomy and FOREAMI.

7. Information system

The following points could be envisaged concerning information:

- The provision of adequate resources of manpower and equipment to SNES;
- The setting up of a system within the Ministry of Trade and Industry for the collection of data on enterprises;
- The publication by that Ministry of a bulletin to pass on this information to industry.

8. Recommendations on financing

A relatively satisfactory financial infrastructure has been set up in Burundi to encourage the development of local industries: the National Economic Development Bank (BNDE) and the Burundi Finance Company (SBF). The report emphasizes the fact that the main current beneficiaries of financial support appear to be above all enterprises engaged in growing coffee, tea and cotton, and that the private sector has been given a special line of credit (with the World Bank) for the promotion of small and medium-sized enterprises. The impact of these latter credits on development still has to be assessed. On the other hand, the National Economic Development Bank (BNDE) has unused lines of credit for lack of project promoters. It would be desirable to consider a data bank within the Ministry of Trade and Industry to act as a source of information on technology for promoters and for representatives of the financial sector, so as to facilitate the practical use of funds.

9. Water and electricity supply

The report stresses the importance of a viable infrastructure for water and electricity supply. For the time being, the following activities merit special attention:

- Increase the amount of water available - increase the number of piped-water supply systems;
- The chemical treatment of water;
- The establishment of microbiological standards for the water currently consumed;
- The development of profitable hydroelectric power stations;
- Extension of the existing network and interconnection of existing networks.

10. Training, research and development in the agro-industrial sector

As already mentioned earlier in this report, Burundi has quite a worthwhile infrastructure as regards basic instruction at the primary school level, education at the level of agricultural advisers and instructors, technicians and development workers, and in higher education. To be more precise, in the perspective of the strengthening of technological capability, Burundi should be able to envisage setting up specific programmes and perhaps institutions or other facilities offering instruction on the preservation and processing of foodstuffs.

The report also noted the important part played by ISABU in agronomic research and, in particular, the role of its recently created food technology department. Nevertheless, the report also notes the limited staffing of this department. In its aim to become better adapted to the needs of the market, the department has taken the encouraging step of inviting industrialists to make their needs known. It would be of interest to examine this situation and to see how generally to strengthen the research and development structures, with particular regard to the basic needs of the country in this area that are mentioned in the annex to the report.

11. Technological development policies and programmes for the food industry

The report has analyzed the policies of Burundi in the sectors that have a bearing on the agro-industrial sector and the role of technology, and has examined specific programmes for the food industry. The development policy of the agricultural sector is clearly essential to the development of Burundi. With a view to strengthening the technological capacity of the country in the agro-industrial sector, an attempt should be made at the strategic option level to identify and promote projects capable of stimulating the agricultural sector in general, and in particular projects for the processing of agricultural products. The study of all agricultural channels and procedures deserves special attention. The report also noted that many of the projects figuring in the Fifth Five-Year Plan aim to provide substitutes for imported foodstuffs. This action could usefully be supplemented by the systematic continuation of the efforts undertaken regarding the projects referred to in this report that have an export potential.

12. Plan for manpower training and technological strengthening of the agro-industrial sector

Manpower training is, perhaps, the most important question that constantly crops up in the areas covered by this report: Burundi urgently needs to strengthen its technological capability not only all along the food-processing chain, but also at the level of agricultural production. Very specific recommendations have been made in each chapter of this report, but it would, nevertheless, still be possible to envisage the production of a systematic plan for personnel training in the food-industry and technology sector to finalize its acquisition, its use and application, its adaptation and its development. The essential aspects of manpower resources were the subject of consideration and discussion between representatives of the various economic agents involved in the sector in question at the national seminar (Bujumbura, 18-22 March 1990).10/

10/ Report of the National Seminar on the Transfer and Development of Technology (UNCTAD/ITP/TEC/Misc.23).

13. Recommendations to donor countries and international organizations

As one of the least developed countries Burundi merits the special attention of donor countries and international organizations on matters relating to development. This is particularly important in the present context in which the international community is seeking to initiate a renewed programme of action in favour of these countries, such as that of the Conference on the least developed countries, of September 1990 - see also the UNCTAD documentation for that Conference, and especially the document on matters concerned with the specific problems of the least developed countries regarding technology transfer and development.11/ In that context, for example, the attempts at the diversification of exports in Burundi deserve support; it is also important to contribute at the international level to the drafting of recommendations aimed at establishing the rights of landlocked countries to a "logistic release from their landlocked state" under economically normal conditions.

11/ Transfer and Development of Technology in the Least Developed Countries: an Assessment of the Major Questions of General Policy (UNCTAD/ITP/TEC/12).

Annex 1

List of institutions and undertakings visited and persons seen by the combined mission

OCIBU Bujumbura	Mr. A. Bazubwabo, Factory Manager, Buterere Mr. Antoine Kinyomvyi, Administrative and Financial Director Mrs. Kaberuka Flora, Technician
Teza Tea Factory P.O.Box 1580, Bujumbura	Mr. Pierre Karyabwite, Tea maker
Muramvya Flour Mill P.O.Box 1110, Bujumbura Telex: 5144 BDI Tel.: 25456	Mr. Ndikundavyi Elie, Director Mr. Nzobonimpa Callixte, Head of Technical Department Mrs. Judith Niyungeko Nahayo, Sales Dept.
MUTOYI	
SOSUMO S.A.R.L. P.O.Box 835, Bujumbura Tel.: 26576 Buja Telex: 5035-SUMO BDI Tel.: 050-7102 to 7106	Mr. Ncabugufi Evariste, Director General Mr. Jean Marie, Sales Director Mr. Sylveste Hakizamana, Head of C.A.R. Mr. Denis Laupo Hung, Factory Manager
BRARUDI Boulevard du 1er Novembre P.O.Box 1423, Bujumbura Telex: BDI 5077	Mr. Ernest Ntibareha, Technical Director, Head of Production
SAVONOR RAMINA P.O.Box 1107, Bujumbura Tel.: 3830	Mr. Kunz, Director Mr. Pascal Kabura, Administrator Mr. Paul Nzeyimana, Head of Production
Bujumbura Central Dairy	
Burundi Palm Oil Mill P.O.Box 9, Rumarge Tel.: 050 6127	Mr. Haryarimaria Leonidas, Director
Bujumbura Abattoirs	Dr. Francois Nzibaiza, Veterinary Surgeon, Head of Meat Inspection Department
VERRUNDI, Bujumbura	Mr. Baltazar Nzeyimana, Technical Director
RAFINA, P.O.Box 482, Bujumbura	Mr. Daniel Ndikumasabo, Administrative Director
FRUITO, P.O.Box 248, Bujumbura Telex: SOBRU-BDI 5043 Tel.: 23856	Mrs. Kigoma Marie Muque, Sales Director

Musaga Health Centre MUSALAC Musaga, P.O.Box 1405 Tel.: 22999, Bujumbura	Dr. Ntizoyimana Pascal, Director Dr. Brander Horst Eimert, Technical Adviser Mr. Nsavyimana Jean-Baptiste, Deputy Director
FABRICHIM Rue des Usines, 12 P.O.Box 1152, Bujumbura Tel.: 25784	Mr. Gabriel Kayibigi, Director
Impeke Industries Ltd.	Mr. E. I. Bazikamwe (visit)
KAPA Bakeries P.O.Box 289, Bujumbura Tel.: 2292	Mr. Ch. Markides, Director Mr. Barahindura Celcius, Domestic Sales Inspector (visiting)
New Butchery/Pork Butchery Bujumbura	
Produlait P.O.Box 2252, Bujumbura Tel.: 31025/31096	Mr. J. Okello, Milk Technologist Mr. Vital Muhera Bugabo, in charge of quality control
ONIMAC Bujumbura	Mr. Nb'onimpa Balthazar, Director Mr. Nahimana Denis, Head of Sales Dept.
Chamber of Commerce and Industry (CCI) Bujumbura	Mr. Dair Mr. B. Ciza Mr. Khelifi (CCI expert) Mr. P. C. Nduwumwami
GERMAN MISSION Maison de l'OTB, ave. l'Uprona P.O.Box 462, Bujumbura	Mr. Willi Kuhn, Economist, Adviser to the Prime Minister and the Ministry of Planning
Industrial Promotion Centre (CPI) P.O.Box 1370, Bujumbura Tel.: 23527/24038 Telex: 5107 BDI	Mr. Jean Ngarambe, Director General Mrs. Béatrice Bovayo, Archivist/Legal Expert
Faculty of Applied Sciences Project BDI/81/004 UNDP, P.O.Box 1490, Bujumbura	Mr. Tarassov, UNESCO Expert
ISABU P.O.Box 795, Bujumbura Tel.: 23390 Telex: 5147 MINAGRI BDI	Dr. Jean Ndikumana, Director Mrs. Christine Kibiriti, Laboratory Head Mr. Jacques Gourdan, Chemical engineer Mr. Patrick Hollebosch, Technical Engineer Mr. Nkeshimana David, Biochemist
Directorate of Scientific Research (MRST), Bujumbura	Mr. Prosper Kiyuku Mr. Tade Bizimungu

Department of Fisheries P.O.Box 631, Bujumbura	Mr. Antoine Kiyuku Director of Fisheries
Board of Management of Public Markets Ministry of Finance Tel.: 25330 ext. 354	Mr. Ndayizigiye J. Berchmans, General Manager, Public Markets
Ministry of Trade and Industry	Mr. Sylvestre Ndikuriyo Mr. Emmanuel Bazikamwe, Alternate Mrs. Valérie Siniremera, Industrial Department Mr. Jean-Bosco Habonimana, Research Dept.
United Nations Development Programme P.O.Box 1490, Bujumbura	Mr. Joseph Kotta (Reg. Rep.) Mr. Paulet (Deputy Reg. Rep.) Mrs. Erhun Guven, Programme Officer Mr. Karorero, Programme Officer
FAO Animal Traction Project Pilot Plant for the production of gari at Rushubi	Mr. Mohamed Beavogni, PTA Mr. Balla Diop, UNV
BNDE National Economic Development Bank P.O.Box 1620, Bujumbura Tel.: 22888 Telex: 5091 BNDE BDI	Mr. Jean-Gaston Baganzicacha, in charge of Industrial Department
Board of Management of Agricultural Planning	Mr. Felix Nahimaina, Adviser Mr. Oscar Ndabikingiye, Adviser
World Bank	
USAID	Mrs. Maria Bwakira, Assistant Programme Officer

Annex 2

Project identification and listing

1. Approach adopted

The prime consideration is that the projects adopted should be suited to the new priorities of Burundi's new industrial policy, i. e. that they should:

(i) Continue the process of lightening the supervisory structures;

(ii) Stimulate activities conducive to a higher output of the factors of production through the giving of a greater degree of responsibility to basic economic operations;

(iii) Direct investment as a priority to production of saleable goods and services;

(iv) To sum up, pursue the policy of State withdrawal from all spheres where private initiative could take over.

In accordance with this policy, the approach adopted is to attach greater importance to SMEs working to satisfy local domestic demand in the food sector, and/or producing goods and services with a high content of local raw materials and a high employment potential.

In that context, the following identification criteria were adopted:

(i) that projects should have a regional purpose, i.e. should be based as a priority on local demand and/or the use of local resources;

(ii) that the projects should be technically and eonomically viable on the operational scale, and small or medium-sized;

(iii) that the start up should be rapid;

(iv) that the technologies involved should be relatively simple and cheap, and that qualified staff should already be available or potentially available without delay;

(v) that the projects should be capable of stimulating the development of other activities higher up or lower down the chain (by the induced effect).

2. Projects proposed

A number of specific project proposals have been selected on the basis of the needs and opportunities set out in this report, and in the light of the identification criteria previously adopted. In accordance with the identification criteria proposed, all the projects have a regional bias, and are based on the priority satisfaction of local demand and/or the development of local resources.

The various projects proposed are given in the list. All are concerned with the needs of agricultural or rural development, and are aimed principally at the development of local resources.

3. List of proposed projects

(1) Project for the development of a central maintenance workshop for machinery and equipment;

(2) Project for the development of the canning and preserving industry for fresh and dried fruit and vegetables;

(3) The Moso Distillery;

(4) Production of gari from manioc;

(5) Production of starch from manioc;

(6) Pork butchery and cooked meats unit;

(7) Palm kernel oil mill;

(8) New Bujumbura abattoir;

(9) Kiryama Cheese Factory;

(10) Infant and baby foods;

(11) Oil mill for avocado and groundnut oil;

(12) Potable spirits;

(13) Vinegar manufacture;

(14) Manufacture of bakers' yeast;

(15) Confectionery;

(16) Pilot bakeries;

(17) Milk processing and packaging;

(18) Pasta

NB. Pre-investment studies for most of these projects are available at the Industrial Promotion Centre.

Annex 3

List of documents consulted

World Bank

Burundi - Problèmes de développement et d'ajustement structurel, 20 January 1988 - Division A13CO - Department of the countries of the Great Lakes and the African Region of the Indian Ocean.

Republic of Burundi

SNES - National Research and Statistics Department, 1987, Annuaire Statistique, No. 52, 1987.

Republic of Burundi

Ministry of National Education, 1981-1982, Recueil collectif des travaux de fin d'études, 3ème promotion - ENEFA, 1981-1982.

Republic of Burundi

Ministry of the Interior, Recensement général de la population, 1987.

Republic of Burundi

Ministry of Rural Development/FAO, February 1988, La commercialisation agricole du Burundi - Rapport de Mission: Jacques Blas.

University Research Centre for Economic and Social Development (CURDES, 1988)

Besoins technologiques en milieu rural au Burundi; Laboratory of the Economics of Rural Development.

International Labour Organization (ILO), 1982

Technologies appropriées dans les industries de transformation alimentaire at de conservation, ILO-PECTA, Addis Ababa, 1982.

International Labour Organization (ILO), 1983

Politique et stratégie d'industrialisation en Afrique - effets sur l'emploi et la distribution des revenus - cas de Burundi, ILO-PECTA, Addis Ababa, 1983.

Republic of Burundi, 1985

Evaluation de la production vivrière au Burundi pour l'année 1985, Presidential Ministry with responsibility for Planning, National Research and Statistics Department.

Société Générale de Service (SOGES), 1986

Réactualisation d'une étude de faisabilité d'aliments pour bétail.

Central Office for Economic Cooperation (CCCE), 1988

Evaluation rétrospective du projet de construction de deux usines à café au Burundi, J. C. Stemmelin, November 1988.

Ministry of Trade and Industry, 1988

Etudes des filières, December 1988.

Ministry of Trade and Industry

Politique sectorielle, July 1988.

Economic Commssion for Africa, 1987

Feasibility study for the establishment of a national programme of composite flour in Burundi, ECA-IND/AGR-002-87.

World Bank, 1983

Burundi: Memorandum sur le secteur manufacturier.

COLEACP, 1987

Etude sur les fruits et légumes au Burundi.

UNCTAD, 1986

Cheik N'diaye et al., The Food Industry in Senegal, United Nations, 1986.

UNCTAD, 1976

Technology and Development Perspectives of the Food Processing Sector in Sierra Leone, UNCTAD/TT/76.

UNCTAD, 1990

Transfer and Development of Technology in the Least Developed Countries: an Assessment of the Major Questions of General Policy, UNCTAD/ITP/TEC/12.

UNCTAD, 1990

The Least Developed Countries: 1990 Report, UNCTAD/TD/B/1289.

UNCTAD, 1989

The Least Developed Countries: 1989 Report, UNCTAD/TD/B/1248.

CURDES, 1984

Boulangeries de Bujumbura et moulins et boulangeries en milieu rural.

EEC, 1988

Rapport annuel sur la mise en oeuvre des conventions CPE/ACP, Burundi, 1988.

Organisation et Gestion Industrielle (OGI), 1987

Etude sur l'efficacité du secteur manufacturier depuis 1976 à nos jours et les stratégies de développement industriel pour l'avenir.

ISABU (Burundi Institute of Agronomic Sciences), 1987

Propositions pour un plan quinquennal de la recherche de l'ISABU.

ISABU

Rapports annuels: 1984, 1985, 1986, 1987.

Bank of the Republic of Burundi

Rapports annuels: 1984, 1985.

ISABU, 1986

Perspectives de la spécialisation régionale comme stratégie de développement.

Department of Waters and Forests

Rapport annuel, 1988.

SNES, 1987

Annuaire statistique.

Republic of Burundi, 1987

IVème Plan Quinquennal de Développement Economique et Social, 1983-1987.

Republic of Burundi, 1988

Vème Plan Quinquennal de Développement Economique et Social, 1988-1992.

كيفية الحصول على منشورات الامم المتحدة

يمكن الحصول على منشورات الامم المتحدة من المكتبات ودور التوزيع في جميع انحاء العالم . استعلم عنها من المكتبة التي تتعامل معها أو اكتب الى : الامم المتحدة ،قسم البيع في نيويورك او في جنيف .

如何购取联合国出版物

联合国出版物在全世界各地的书店和经售处均有发售。请向书店询问或写信到纽约或日内瓦的联合国销售组。

HOW TO OBTAIN UNITED NATIONS PUBLICATIONS

United Nations publications may be obtained from bookstores and distributors throughout the world. Consult your bookstore or write to: United Nations, Sales Section, New York or Geneva.

COMMENT SE PROCURER LES PUBLICATIONS DES NATIONS UNIES

Les publications des Nations Unies sont en vente dans les librairies et les agences dépositaires du monde entier. Informez-vous auprès de votre libraire ou adressez-vous à : Nations Unies, Section des ventes, New York ou Genève.

КАК ПОЛУЧИТЬ ИЗДАНИЯ ОРГАНИЗАЦИИ ОБЪЕДИНЕННЫХ НАЦИЙ

Издания Организации Объединенных Наций можно купить в книжных магазинах и агентствах во всех районах мира. Наводите справки об изданиях в вашем книжном магазине или пишите по адресу: Организация Объединенных Наций, Секция по продаже изданий, Нью-Йорк или Женева.

COMO CONSEGUIR PUBLICACIONES DE LAS NACIONES UNIDAS

Las publicaciones de las Naciones Unidas están en venta en librerías y casas distribuidoras en todas partes del mundo. Consulte a su librero o diríjase a: Naciones Unidas, Sección de Ventas, Nueva York o Ginebra.

Printed at United Nations, Geneva
GE.92-55314–August 1992–3,160

United Nations publication

UNCTAD/ITP/TEC/25